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The Impact of the use of Modern Teaching Technologies (MTT) In Educational Process at the Faculty of Education, Jazan University

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ABSTRACT

The purpose of this study was to investigate the use of Modern Teaching Technologies (MTT) among faculty staff members at the Faculty of Education, Jazan University. The study conducted in the academic year 2016. A Systematic random sample of (130) faculty staff members was used. The faculty staff members were asked to express their attitudes towards the use of modern teaching technologies in educational processes. A questionnaire was used for collecting data. The data analyzed with SPSS personal computer program. Appropriate statistics for description (frequencies, percentage, means, standard deviations, T-Test and ANOVA Test) were used. The results showed that: There were significant differences at the level of significance (0.05) between faculty staff responses on the impact of the use of modern teaching technologies in the educational process in favor of male participants. Thus, the null hypothesis (H0: $\mu 1=\mu 2$) was rejected; There were significant differences at the level of significance (0.05) between the study participants attitudes towards the use of modern teaching technologies in the educational process, related to experience variable. Thus, The null hypothesis was rejected; There were no significant differences at the level of significance (0.05) between the study participants attitudes towards the use of modern teaching technologies in the educational process, related to computer training courses. Thus, the null hypothesis (H0) was accepted. The researcher concluded that faculty staff members have a positive attitude towards the use of modern teaching technologies in the educational process. The researcher, also, stated some recommendations.

Keywords : Faculty staff Members, Modern Teaching Technologies (MTT), Faculty of Education, Jazan University.

I. INTRODUCTION

Modern teaching technologies have been part of the teaching and learning environment. It is one of the resources that teachers use to help facilitate student learning. The increasing variety and accessibility of modern teaching technologies have expanded the tools and the opportunities teachers have to use technology. Computer devices are more powerful and come in different forms, from those that sit on our desks to those that sit in the palm of our hands. The internet connects those devices and connects students to each other in the classroom, through the school, and around the world. Technological devices and networks have changed schools and classrooms (Eady & Lockyer, 2013).

The important role of modern teaching technologies play in education gives teachers the opportunity to design meaningful learning experiences that embed technology. Teachers always considered the tools and resources that can best support learning activities for

their students. However, advances and accessibility of modern teaching technologies have made the possibilities seem almost endless (Cuban, 2003).

It is important for teachers to embed technology appropriately in teaching and learning processes. A teacher has many considerations in designing the appropriate use of modern teaching technologies in educational process. Teachers have to keep up to date with the technological tools that are available to them (ibid).

Making modern teaching technologies available in schools does not mean that teachers will make use of them, so it is necessarily for teacher to use them effectively in educational process (ibid).

Teachers can embed modern teaching technologies into students activities, such as word-processing, presentation and publishing software, webpage authoring tools, email, and online discussion. These technologies allow students to communicate with their teachers as well as with each other using text, images, sound, and video (Eady & Lockyer, op. cit.).

Is it true that not all teachers are embedding technology into their teaching? A significant body of research has investigated why this occurs. Teachers face many difficulties in using technology in the classroom, such as lack of resources, technophobia, and lack of training programs in the use of technology in teaching. Some resource barriers are being overcome with an increasing number of computers and software applications and faster, more reliable networks in schools. Teachers will avoid using technology if it does not work properly or there is a lack of technical support in their school. Teachers also need training programs on new technology tools that they can use in their teaching. The important factors in the use of technology in the classroom, are teacher knowledge and skills. Lack of specific technical skills is a common reason teachers give for not using technology (Hew & Brush, 2007).

However, teachers who undertake training programs to build skills through professional development activities are much more likely to integrate technology into their teaching than those who do not (Mueller et al., 2008).

Modern teaching technologies are an inevitable part of society, that cause teachers to consider the implications for them in their role as teachers and as lifelong learners themselves. This does not mean that teachers naturally understand how to use those technologies appropriately. The challenge for teachers is to draw upon their continually developing knowledge and skills about what to teach and how to teach (Eady & Lockyer, op. cit.).

If teachers understand the importance of integrating modern technology into their classrooms and receive the professional development needed in their fields, they could become accustomed to using technology tools; therefore, student learning and motivation could increase (Young, 2008).

Although e-mail is well established in undergraduate education, it is not fully integrated into the curriculum. E-mail and computing often limit to courses that focus on a necessary tool, such as computer programming or statistics courses. Using e-mail in the undergraduate curriculum as an instructional tool is still relatively new, but introducing e-mail into any curriculum has many potential benefits (Hassett, et al. 1995).

Students and teachers both benefit from using e-mail. Using e-mail as one of the modern technologies is the first step in using the Internet, in research and

education. Students who use e-mail find that teachers are accessible for more than office hours. E-mail extends office hours to virtually any time and place, to the mutual convenience of faculty and students. (ibid).

E-mail allows students and teachers to join with each other and students themselves and other learners, from all over the globe, in discussions of mutual educational interest. This enlarged "peer group" brings together people from other cultures, religions, educational systems, and political systems, enriching students on the local campus (ibid).

Internet use in classrooms helps both teachers and students to share information with each other, to discuss the opinions of other users, and to communicate with people from different locales in common interest areas. Internet use helps students, acquire the skills needed for searching and researching without guided instruction. Appropriate classroom techniques can help students acquire skills and desired behavior more efficiently (Sezer, 2010).

Using email as an educational tool can create a healthy academic atmosphere via better interaction between the staff member and student, and students themselves (Sadat & Rahman, 2015).

Internet and websites provide information in different areas through the use of words, pictures, illustrations, voices, and images. This information is offered to an unlimited number of users over the world with low costs in virtual platforms, making the web an unrivalled form of entertainment and consumption (Lateh & Raman, 2005).

Dreaweesh (2003) study was conducted to examined the differences between the second-grade students in the achievement of the science subject by means of a multimedia program and the traditional method of teaching at the levels of (remember, understanding, application), in the Bloom Taxonomy, of each individual. The sample was randomly selected (control group and experimental group). The researcher has built a test of achievement in the light of the content and has been verified the validity and stability. The study concluded the following results:

There were no significance differences at the level of significance (0.05) between the average of the experimental group and the control group in the pre-measurement of the achievement level, in the light of the Bloom Taxonomy (remember, understanding, application), indicating the homogeneity of the experimental and control groups and similar before the procedure Experience.

There were significant differences at the level of significance (0.05) between the experimental group and the control group average in the post-measurement of the achievement level in the light of the Bloom classification (remember, understand, application) in the favor of the experimental group.

Al-Nadawi (2012) studied the importance of using educational techniques and their role in developing methodologies of physical education and their importance in choosing and organizing the method followed. The researcher hypothesized a statistically significant relationship between the use of educational techniques and developing physical education methodologies. The researcher made a (26) items survey after shown on a panel of experts. The study sample was (23) teachers at the Colleges and departments with physical education methodologies at the University of Mosul. The researcher concluded that, educational techniques have an important role in choosing and organizing the desired methodology. The researcher recommended that, the necessity of

using teaching aids by the teaching or the educational techniques that coincides with the content and goals of the lesson and the necessity of verifying educational techniques to make them more useful and interesting.

Also, Al-Ajlooni (2009) set up a study to examine the reality of ICT in the Faculty of Educational Sciences at the University of Jordan, the availability of infrastructure, the extent of use by graduate students in the college, and the obstacles to use. The study sample were all the graduate students in the Faculty of Educational Sciences at the University of Jordan who registered during the second semester of the academic year 2006/2007. The study sample was (819) students, distributed to (551) master students and (302) Ph.D. students. A questionnaire was used for collecting data. The results showed that the development of computer tools and devices available in the computer labs in the Faculty of Educational Sciences is good in number and proportion; the laboratories of the Faculty of Educational Sciences possess software with general objectives. The main obstacle facing the use of ICTs is the lack of hardware in computer labs, the low speed of data processing devices, the large number of students in one subject, the lack of software programs, and the lack of adequate training for faculty members on the use of the Internet. The results did not reveal any significant differences at the level (0.05 = α) in the degree of the use of postgraduate students in information technology related to gender and degree (M.Sc., Ph.D.).

Nagel (2018) study examined the use of teaching technologies in the classroom among the teacher at Mid-America Nazarene University. The study sample was (1000) teachers who've been in the profession for a minimum of five years. The result indicated that teachers are most positive about technology in the classroom, it also makes students more productive, and it stimulates students more intellectually. The teaching technologies brought the classroom into the modern era and enhanced learning and teaching.

The study of Al-Fahmi (2012) aimed to Recognize the importance of using e-learning in teaching social subjects from the point of view of secondary school teachers in Macca city, Saudi Arabia. A descriptive study approach was used. The study population contained all the teachers of the social subjects in Mecca that reached (190) teachers. A random sample from the study population (110) was chosen. A questionnaire was used as study Techniques. The data were analysed by SPSS program. The statistical analysis included: the mean, Standard Deviation, T-Test, Variance Analysing. The study showed the following results: There were significant differences at the level (0.05) relating the importance of using the electronic teaching in teaching the social subjects in favor of the variable (years of experience); There were no significant differences at the level of significance (0.05) between the average of the degree of the studied sample relating the importance of using the electronic teaching in teaching the social subjects. There were significant differences at the level (0.05) relating the usage for the teachers who have training courses, relating the difficulties in using it in favor of the teachers who do not have training courses; There were no significant differences at the level (0.05) between the average of the degree of the studied sample relating the importance of using the electronic teaching in teaching the social subjects according to their knowledge of using the computer; There were significant differences at the level (0.05) relating the usage for the teachers who know how to use the computer, relating the difficulties in using it in favor of the teachers who do not know how to use the computer. In light of the results of the study, the researcher recommended the following: The

necessity for the competent authorities to adopt electronic teaching project and apply it in schools. The researcher also provided many relevant suggestions to the current study.

In the same way, Mohamed (2013) conducted a study to investigate the attitudes of faculty members at the Faculty of Education Hantoub towards the use of e-learning methods and techniques and their relationship with gender, academic level and years of experience. In order to know these trends, the researcher constructed a questionnaire and verified its validity. The researcher used the descriptive analytical method. The study concluded that there were positive attitudes towards the use of e-learning methods and techniques. There were statistically significant differences between male and female attitudes in favor of males, and there were no differences attributable to academic level and years of experience.

II. METHODS AND MATERIAL

Sample and Data Collection

The sample of the study consisted of (130) subjects, who had been chosen from the population of faculty staff members who teach in different programs in the College of Education at Jazan University.

The sample had been selected from the study population by using a systematic random sample. A Questionnaire was used for collecting data. The researcher had measured the validity and reliability of the questionnaire by using: Pearson Correlation Coefficient and Cronbach Alpha Coefficient. The researcher had used Likert Scale. A typical three-level Likert item had been used in the questionnaire, the three-level Likert item as follows: (Agree), (to some extent), (Disagree). The data were analyzed with SPSS personal computer program.

Analysing Data

All data were analyzed with the SPSS personal computer program. Appropriate statistics for description (frequencies, percentage, means, standard deviations, T-Test and ANOVA Test) were used.

The hypotheses

1- There are positive attitudes in faculty staff responses towards the use of modern teaching technologies in the educational process.

2- There are no significant differences at the level of significance (0.05) between faculty staff responses on the impact of the use of modern teaching technologies in the educational process, related to gender variable.

$$H0: \mu1=\mu2$$
$$HA: \mu1\neq\mu2$$

3- There are no significant differences at the level of significance (0.05) between faculty staff responses on the impact of the use of modern teaching technologies in the educational process, related to experience variable.

$$H0: \mu1=\mu2=\mu3$$
$$HA: \mu1\neq\mu2\neq\mu3$$

4- There are no significant differences at the level of significance (0.05) between faculty staff responses, related to computer training course variable.

$$H0: \mu1=\mu2=\mu3$$
$$HA: \mu1\neq\mu2\neq\mu3$$

(or at least two means are not equal)

III.RESULTS AND DISCUSSION

Research participants

The research participants consisted of (130) faculty staff members, who participated in this study and filled out and submitted the questionnaire. All

participants were members of the faculty of education, Jazan University. Information pertaining to the personal and vocational details of the study group is given in Table (1).

TABLE (1): PERSONAL DATA OF FACULTY STAFF MEMBERS

No	Variable	Variable Type	Frequency (F)	%
1.	Gender	Male	21	16.2
		Female	109	83.8
2.	Education Level	Bachelor	2	1.5
		Master Science	42	32.3
		Ph.D.	86	66.2
3.	Specialization	Science	75	57.7
		Arts	55	42.3
4.	Background	Education	84	64.6
		Non-Education	46	35.4
5.	Occupation	Teaching Assistant	2	1.5
		Lecturer	42	32.3
		Assistant Professor	70	53.8
		Associate Professor	12	9.2
		Professor	4	3.1
6.	Experience	Less than 5 years	41	31.5
		5-10 years	21	16.2
		More than 10 years	68	52.3
7.	Computer Training	No training courses	16	12.3
		One training course	22	16.9
		Two training courses	31	23.8
		More than two	61	46.9
8.	Technology Training	No training courses	29	22.3
9.		One training course	25	19.2
10.		Two training courses	29	22.3
11.		More than two	47	36.2

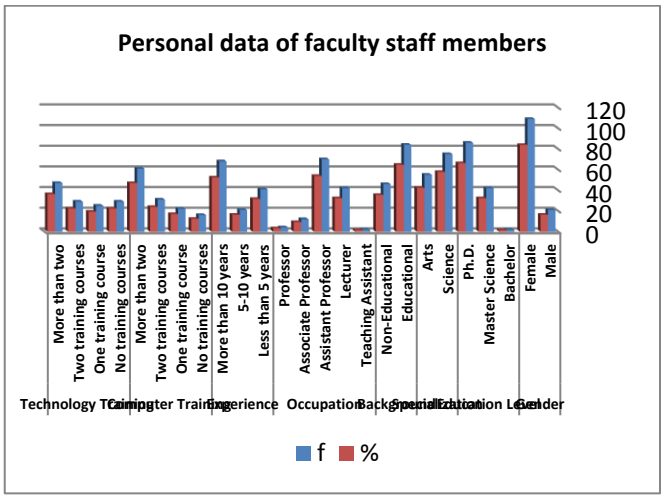

Figure (1): Personal Data of Faculty Staff Members

Table (1) and Figure (1) showed that (16.2%) (f: 21) of the study participants were male, with (83.8%) (f: 109) female. In review of education level correlation, Ph.D. is the largest group (66.2%) (f: 86), master science is the second largest (32.3%) (f: 42) and bachelor is third largest (1.5%) (f: 2). In review of specialization correlation, science is the largest group (57.2%) (f: 75), arts is the second largest (42.3%) (f: 55). In the term of education background correlation, education is the largest group (64.6%) (f: 84), non-education is the second largest (35.4%) (f: 46). In review of occupation correlation, assistant professor is the largest group (53.8%) (f: 70), lecturer is the second largest (32.3%) (f: 42), associate professor is

third largest (9.2%) (f: 12), professor is the fourth largest (3.1%) (f: 4), and teaching assistant is the fifth largest (1.5%) (2). In terms of experience correlation, the largest group has more than 10 years' experience (52.3%) (f: 68), the second largest group has less than 5 years' experience (31.5%) (f: 41), while those with 5 to 10 years' experience is the third largest (16.2%) (f: 21). In review of correlation of computer training programs, those who attended more than two training courses are in the largest group (46.9%) (f: 61), those who attended two training courses are in the second largest (23.8%) (f: 31), those who attended one training course are in the third largest (16.9%) (f: 22), and those who not attended any training courses are in the fourth largest (12.3%) (f: 16). In the term of correlation of technology training programs, those who attended more than two training courses are in the largest group (36.2%) (f: 47), those who attended two training courses, and who not attended any training courses are in the second largest (22.3%) (f: 29), and those who attended one training course are in the third largest (19.2%) (f: 25).

The first hypothesis : There are positive attitudes in faculty staff responses towards the use of modern teaching technologies in the educational process.

To verify this hypothesis the questionnaire was divided to five aspects, each aspect consisted of a number of items. Mean and Std. Deviation values for each item were calculated.

Questionnaire Aspects

The first aspect: Culture of using modern teaching technology

The first aspect consisted of twelve items (1, 3-4, 6-7, 9, 11, 13, 17, and 25-27). Mean and standard deviation for the first aspect items (Faculty staff culture on using modern teaching technology) were analysed. Table (2) displayed the mean and standard deviation analysis.

Table (2) : Mean and Standard Deviation Analysis for Faculty Staff Culure On Using MTT

No.	Item	Mean	Standard Deviation
1.	Computer is one of the basics modern teaching technologies	2.95	0.23
2.	Computer learning is essential for every faculty member	2.96	0.19
3.	I am proficient in dealing with computers	2.68	0.48
4.	I need training for using the presentation program	1.89	0.83
5.	It is important to constantly train on the latest presentation software	2.92	0.31
6.	I'm good in using Microsoft Word program	2.84	0.40
7.	Learning the Internet is essential for every faculty member	2.97	0.17
8.	I have the skill of searching through the internet	2.78	0.47
9.	I need training in using e-mail in the learning process	1.85	0.81
10.	I can connect the data projector to the computer easily	2.38	0.76
11.	I have the knowledge of running the data projector	2.50	0.66

No.	Item	Mean	Standard Deviation
12.	I face difficulties in adjusting the data projector with the computer	1.72	0.72

Table (2) showed values of standard deviation & Mean for the study sample culture on using MTT. The biggest mean value (2.97) and standard deviation (0.17) is for participants who see the learning of the Internet is essential for the faculty member. The second biggest mean value (2.96) and standard deviation (0.19) is for those who see the computer learning is essential for the faculty staff. The third biggest mean value (2.95) and standard deviation (0.23), is for the participants who see computer is one of the basics modern teaching technologies. The fourth biggest mean (2.92) and standard deviation (0.31) is for the participants who see constantly training on the latest presentation software is important for faculty staff members. The fifth biggest mean (2.84) and standard deviation (0.40) is for the participants who have the skill of using Microsoft Word application programs. The sixth biggest mean (2.78) and standard deviation (0.47) is for the participants who have the skill of searching through the internet. The seventh biggest mean (2.68) and standard deviation (0.48) is for the participants who are proficient in dealing with computers. The eighth biggest mean (2.50) and standard deviation (0.66) is for the participants who have the knowledge of running the data projector. The Ninth biggest mean (2.38) and standard deviation (0.76) is for the participants who can connect the data projector to the computer easily. The Tenth biggest mean (1.89) and standard deviation (0.76) is for the participants who need training for using the presentation program. The eleventh biggest mean (1.85) and standard deviation (0.81) is for the participants who need training in using e-mail in the learning process. The twelfth biggest mean (1.72) and standard deviation (0.72) is for the participants who face difficulties in adjusting the data projector with the computer.

It is clear from the above that the faculty staff members at the college of education, Jazan university have the culture of using modern teaching technology in educational process.

The second aspect: Reality of use of modern teaching technologies in educational process

The reality of use of modern teaching technologies in teaching consisted of nine questionnaire items (2, 5, 8, 18-19, 21, 31, 37, 38). Mean and standard deviation for the second aspect items (Reality of use of modern teaching technologies in educational process) were analysed. Table (3) displayed the mean and standard deviation analysis.

Table (3): Mean And Standard Deviation Analysis of The Reality of Use Of MTT

No.	Item	Mean	Standard Deviation
1.	I use computer in teaching process	2.91	0.29
2.	The use of computers helps students to learn problem solving skills	2.75	0.43
3.	I use the presentation program in preparing my lectures	2.54	0.65
4.	I received students' assignments via email	1.65	0.82
5.	I use email as a communication channel between me and my students	1.89	0.81
6.	I have a website	2.35	0.93

No.	Item	Mean	Standard Deviation
7.	I prefer to use modern teaching technologies in teaching my courses	2.67	0.60
8.	I can reach my students to the degree of mastery without the use of modern teaching technologies	2.02	0.83
9.	The traditional teaching method gives better results than using modern teaching technologies	1.61	0.74

Table (3) showed values of standard deviation & Mean for the study sample reality of use of MTT. The biggest mean value (2.91) and standard deviation (0.29) is for participants who are using computer in teaching process. The second biggest mean value (2.75) and standard deviation (0.43) is for participants who see that, the use of computers helps students to learn problem solving skills. The third biggest mean value (2.67) and standard deviation (0.60), is for those who prefer to use modern teaching technologies in their classrooms. The fourth biggest mean (2.54) and standard deviation (0.65) is for the participants who use the presentation program in preparing their lectures. The fifth biggest mean (2.35) and standard deviation (0.93) is for the participants who have websites. The sixth biggest mean (2.02) and standard deviation (0.83) is for the participants who mentioned that, they can reach the student to the degree of mastery without the use of modern teaching technologies. The seventh biggest mean (1.89) and standard deviation (0.81) is for the participants who use email as a communication channel between them and their students. The eighth biggest mean (1.65) and standard deviation (0.82) is for the participants who received students' assignments via email. The ninth biggest mean (1.61) and standard deviation (0.74) is for the participants who see that, the traditional teaching method gives better results than modern teaching technologies.

According to the results of the study, the faculty staff members have positive attitudes towards the reality of use of modern technologies in educational process, except for reach the student to the degree of mastery without the use of modern teaching technologies (34.6%) (f: 45) of the participants answered with (Agree) which approximately similar to (33.1%) (f: 43) who answered with (Disagree), receiving students' assignments via email (56.9%) (f: 74) answered with (Disagree), while only (21.5%) (f: 28) answered with (Agree), using email as a communication channel between them and their students (39.2%) (f: 51) answered with (Disagree), while only (27.7%) (f: 36) answered with (Agree), and who prefer traditional teaching methods than using modern technologies (54.6%) (f: 71) answered with (Disagree), while only (15.4%) (f: 20) answered with (Agree).

The third aspect: The benefit of modern teaching technologies to faculty staff and student

The benefit of modern teaching technologies to faculty staff and student consisted of nine questionnaire items (15-16, 19, 22-23, 30, 33-34, 36). Mean and standard deviation for the third aspect items (The benefit of modern teaching technologies to faculty staff and student) were analysed. Table (4) displayed the mean and standard deviation analysis.

Table (4): Mean and Standard Deviation Analysis of The Benefit of MTT to Faculty Staff

No.	Item	Mean	Standard Deviation
1.	I'm asking my students to search for some information through the Internet	2.60	0.59
2.	I urge my students to make use of the information available on the Internet	2.77	0.45
3.	On my website I upload lectures and information that benefit the student	1.56	0.78
4.	I often urge my students to browse my website	1.73	0.83
5.	The use of modern teaching technologies facilitates student's understanding	2.85	0.40
6.	E-learning techniques help students connect theoretical and practical concepts	2.74	0.46
7.	Modern teaching technologies help students to develop their creative skills	2.77	0.45

Table (4) showed values of standard deviation & Mean for the study sample benefit of modern teaching technologies. The biggest mean value (2.85) and standard deviation (0.40) is for participants who see that the use of modern teaching technologies facilitates student's understanding. The second biggest mean value (2.77) and standard deviation (0.45) is participants who are urging their students to make use of the information available on the Internet, and, also, who see that the modern teaching technologies help students to develop their creative skills. The third biggest mean value (2.74) and standard deviation (0.46), is for those who see the e-learning techniques help students in connecting theoretical and practical concepts. The fourth biggest mean (2.60) and standard deviation (0.59) is for the participants who are asking their students to search for some information through the Internet. The fifth biggest mean (1.73) and standard deviation (0.83) is for the participants who often urge their students to browse their website. The sixth biggest mean (1.56) and standard deviation (0.78) is for the participants who uploaded their lectures and information that benefit the students on their websites.

According to the study results, the faculty staff members have positive attitudes towards the benefit of modern teaching technologies to faculty staff and student, except for uploading lectures on their websites (61.5%) (f: 80) answered with (Disagree), while only (17.7%) (f: 23) answered with (Agree), urging their students to browse their website (50.8%) (f: 66) answered with (Disagree), while only (23.8%) (f: 30) answered with (Agree).

The fourth aspect: The technology infrastructure

The technology infrastructure consisted of five questionnaire items (10, 14, 24, 28, and 29). Mean and standard deviation for the fourth aspect items (The benefit of modern teaching technologies to faculty staff and student) were analysed. Table (5) displayed the Mean and standard Deviation analysis.

Table (5): Mean and Standard Deviation Analysis of Technology Infrastructure

No.	Item	Mean	Standard Deviation
1.	Data projector is an important devices in the classroom	2.91	0.29
2.	The Internet is available in the lecture rooms	1.29	0.70
3.	The classrooms were equipped with data projectors	2.23	0.96
4.	The classroom were equipped with electrical connections	2.35	0.91
5.	Classrooms contain platforms for laptops	1.88	0.90

Table (5) showed values of standard deviation & Mean for the technology infrastructure. The biggest mean value (2.91) and standard deviation (0.29) is for participants who see that data projector is an important devices in the classroom. The second biggest mean value (2.35) and standard deviation (0.91) is participants who see that, the classrooms were equipped with electrical connections. The third biggest mean value (2.23) and standard deviation (0.96), is for those who see that, the classrooms were equipped with data projectors. The fourth biggest mean (1.88) and standard deviation (0.90) is for the participants who mentioned that, the classrooms contained platforms for laptops. The fifth biggest mean (1.29) and standard deviation (0.70) is for the participants who stated that, the Internet is available in the lecture rooms.

It is clear from the above that college of education, Jazan university have the infrastructure for modern technologies**,** except the availability of the Internet in lecture rooms (84.6%) (f: 110) of participants who answered with (Disagree), while only (13.8%) (f: 18) of them answered with (Agree), and the availability of platforms in the classrooms (46.9%) (f: 61) of the participants answered with (Disagree), while (35.4%) (f: 46) were answered with (Agree).

The fifth aspect: Obstacles to use

The Obstacles to use consisted of four questionnaire items (20, 32, 35, and 37). Mean and standard deviation for the fifth aspect items (The Obstacles to use of modern teaching technologies in educational process) were analysed. Table (6) displayed the mean and standard deviation analysis.

Table (6) : Mean and Standard Deviation Analysis for Obstacles to Use

N0.	Item	Mean	Standard Deviation
1.	E-mail takes a lot of my time	1.89	0.72
2.	The use of modern teaching technologies adds a burden to the faculty member	1.72	0.71
3.	The use of modern teaching technologies in teaching wastes a lot of my time	1.60	0.72

Table (6) showed values of standard deviation & Mean for the obstacles to use. The biggest mean value (1.89) and standard deviation (0.72) is for participants who see that, e-mail takes a lot of their times. The second biggest mean value (1.72) and standard

deviation (0.71) is participants who see that, the use of modern teaching technologies adds a burden to the faculty member. The third biggest mean value (1.60) and standard deviation (0.72), is for those who see that, the use of modern teaching technologies in teaching wastes a lot of their times.

According to the study results, the faculty staff members have positive attitudes towards obstacles to use. That means, most of the participant stated that, there were no obstacle to use of modern technologies in educational process.

So, according to the results of participant responses to the questionnaire aspects, the study participants have a positive attitude towards the use of modern teaching technologies in the educational process.

The second hypothesis: There are no significant differences at the level of significance (0.05) between faculty staff responses on the impact of the use of modern teaching technologies in the educational process, related to gender variable.

H0: μ1=μ2

HA: μ1≠μ2

This hypothesis aimed to indicate whether the gender variable has an impact on faculty staff members attitudes towards the use of modern teaching technologies in the educational process. To test this hypothesis, the T-test was used for the difference between two independent sample averages and the results were shown in Table (7).

Table (7): Mmeans & Std. Deviation & T-Test Values of Study Participants

Gender	N	Mean	Std. Deviation	t	df	Sig. (2 tailed)	95% confidence Interval		Sig.
							Lower	Upper	
Male	21	3.62	0.59	4.047	51.781	0.000	0.339	1.008	Sig.
Female	109	2.95	1.10						

Table (7) showed that the mean value of males' attitudes towards the impact of the use of modern teaching technologies in the educational process (3.62), whereas the females' mean value is (2.95). The calculated t value is (4.047) which is bigger than statistical table t value (2.000), df (51.781). As Cal t > Tab t, and Sig. (2-tailed) (0.000) is less than 0.025. This indicated that there were significant differences at the level of significance (0.05) between male and female participants in favor of male participants. Thus, the null hypothesis (H0: μ1=μ2) was rejected and alternative (HA: μ1≠μ2) was accepted.

The third hypothesis: There are no significant differences at the level of significance (0.05) between faculty staff responses on the impact of the use of modern teaching technologies in the educational process, related to experience variable.

H0: μ1=μ2=μ3

HA: μ1≠μ2≠μ3

This hypothesis aimed to indicate whether the experience variable has an impact on faculty staff members attitudes towards the use of modern teaching technologies in the educational process, related to experience variable. To test this hypothesis, the One ANOVA Test was used. Table (8) showed

means and standard deviation values of the study participants.

Table (8): The Table Present the Means & Std. Deviation Values of Study Participants

Variable (Experience)	N	Mean	Std. Deviation	95% Confidence Interval	
				Lower	Upper
Less than 5 years	41	1.92	0.264	1.843	2.010
5-10 years	21	1.66	0.483	1.447	1.886
More than 10 years	68	1.93	0.271	1.848	2.028

Table (8) showed the mean & std. deviation values of study participants' attitudes towards the use of modern teaching technologies in the educational process, related to experience variable. The mean value of participants who have more than 10 yeas' experience reached (1.93), whereas the mean value of the participants who have experience less than 5 years reached (1.92), and the mean value of participants who have from 5-10 years' experience reached (1.66), so, as showed in table (8), $\mu 1 \neq \mu 2 \neq \mu 3$. To verify this result, one-way ANOVA test was used, as appeared in Table (9).

Table (9): The Table Presents One Way Anova Test to Find Out Differences Between Study Participants According to Experience Variable

Sources of contrast	Sum of squares	df	Mean squares	F	Sig.
Between groups	0.940	2	0.470	3.581	0.031
Within groups	16.668	127	0.131		
Total	17.608	129			

Table (9) showed calculated (Cal) (F) value as an indication of differences between the study participants attitudes towards the use of modern teaching technologies in the educational process, related to experience variable. Cal (F) value was (3.581), whereas (F) value that derived from statistical table (Tab) was (2.995). Since Cal (F) value>Tab (F) value, and also level of significant adopted for this study (0.05)> (0.031). Thus, the null hypothesis (H0) (There are no significant differences at the level of significance (0.05) between the study participants attitudes towards the use of modern teaching technologies in the educational process, related to experience variable) was rejected. Once the null hypothesis was rejected, we have to determined which of the means is not equal, to verify this, comparison differences was used to compare each two mean values together, the hypotheses for this is as follows:

$H0: \mu i = \mu j,$

$HA: \mu i \pm \mu j , \ i < j = 1,2,3$

Table (10): The Table Presents Multiple Comporision To Compare Mean Values Together

	Experience(i)	Experience(j)	Mean difference (i-j)	Std. Error	Sig.	95% Confidence Interval	
						Lower	Upper
LCD	Less than 5 years	5-10 years	0.260*	0.972	0.008	0.068	0.453
		More than 10 years	0.088	0.072	0.218	-0.053	0.230
	5-10 years	Less than 5 years	-0.260*	0.972	0.008	-0.453	-0.618
		More than 10 years	-0.272*	0.904	0.006	-0.351	0.007
	More than 10 years	Less than 5 years	-0.088	0.072	0.218	-0.230	0.053
		5-10 years	0.272*	0.904	0.006	-0.007	0.351

*The mean difference is significant at the (0.05) level

Table (10) showed the comparison mean values, which compared each two mean values together to determine which is significance. The researcher notice that: The differences between mean values of (Less than 5 years) group and (5-10 years) group is significance. The difference between mean values of (Less than 5 years) group and (More than 10 years) group is not significance. The difference between mean values of (5-10 years) group and (More than 10 years) group is significance.

The fourth hypothesis: There are no significant differences at the level of significance (0.05) between faculty staff responses on the impact of the use of modern teaching technologies in the educational process, related to computer training variable.

H0: μ1=μ2=μ3

HA: μ1≠μ2≠μ3

(or at least two means are not equal)

This hypothesis aimed to indicate whether the computer training variable has an impact on faculty staff members attitudes towards the use of modern teaching technologies in the educational process. To test this hypothesis, the ANOVA test was used. Table (11) showed means and standard deviation values of the study participants.

Table (11): The Table Presesnts The & Std. Deviation Values of Study Participants

Variable	N	Mean	Std. deviation	95% Confidence Interval	
				Lower	Upper
No computer training found	16	2.00	0.000	2.000	2.000
One computer training course	22	1.95	0.213	1.860	2.049
Two computer training courses	31	1.81	0.402	1.059	1.953
More than two courses	61	1.77	0.424	1.662	1.879

Table (11) showed that, there is a large convergence between the mean values of study participants' attitudes towards the use of modern teaching technologies in the educational process, due to computer training courses. The mean value of the participants who were not attended any computer course reached (2.00), whereas the mean value of participants who attended one computer course reached (1.95), and the mean value of participants who attended two computer courses reached (1.81), and the mean value of participants who attended more than two computer courses reached (1.77). To verify this result, one-way ANOVA test was used, as appears in Table (12).

Table (12): The Table Presents One Way Anova Test to Find Out Differences Between Study Participants According to Age Variable

Sources of contrast	Sum of squares	df	Mean squares	F	Sig.
Between groups	1.028	3	0.343	2.603	0.055
Within groups	16.580	126	0.132		
Total	17.608	129			

Table (12) showed calculated (Cal) (F) value as an indication of differences between the study participants attitudes towards the use of modern teaching technologies in the educational process due to computer training courses. Cal (F) value was (2.603), whereas (F) value that derived from statistical table (Tab) was (2.995). Since Tab (F) value>Cal (F) value, and also level of significant adopted for this study (0.05)<(0.055). Thus, the null hypothesis (H0) (There are no significant differences at the level of significance (0.05) between the study participants attitudes towards the use of modern teaching technologies in the educational process, due to computer training courses) was accepted.

IV. CONCLUSION

Personal data of the faculty staff members was analysed. (83.8%) of the study participants were female staff members; (66.2%) of participants were Ph. D. holders; (57%) of participants were science specialization; (64.6%) of participants were faculty staff who related to the field of education; (53.8%) of the participant were assistant professors; (53.3%) of study participants were had experience more than five years; (46.9%) of the participants were attended more than two computer training courses; (36.2%) of the participants attended more than two technology training courses.

According to the participants' responses to the questionnaire aspects, the study participants have a positive attitudes towards the use of modern teaching technologies in the educational process.

There are significant differences at the level of significance (0.05) between faculty staff responses on the impact of the use of modern teaching technologies in the educational process in favor of male participants. Thus, the null hypothesis (H0: $\mu1=\mu2$) was rejected.

There are significant differences at the level of significance (0.05) between the study participants' attitudes towards the use of modern teaching technologies in the educational process, related to experience variable. Thus. The null hypothesis was rejected.

There are no significant differences at the level of significance (0.05) between the study participants' attitudes towards the use of modern teaching technologies in the educational process, due to computer training courses. Thus, the null hypothesis (H0) was accepted.

The researcher concluded that, faculty staff members have a positive attitude towards the usage of modern teaching technologies in the educational process.

V. RECOMMENDATIONS

Modern teaching techniques are a vital technique in the teaching and learning process. In order for faculty staff members to make effective use of them, they must be involved in appropriate training programs.

Although the use of modern teaching technologies is inexpensive, there are still faculty staff members who are unable to use them in the classroom.

The learning environment needs more attention and more facilities so that a faculty staff member can use modern teaching techniques in the classroom.

VI. REFERENCES

[1]. Ajlooni, K. (2009). The reality of use of ICT by graduate students in the Faculty of Educational Sciences at the University of Jordan (Ph. D. Thesis). Studies, Educational Sciences, vol. 36, (Annex), 2009. Retrieved from https://journals.ju.edu.jo/DirasatEdu/article/download/689/687

[2]. Al-Nadawi, F. (2012). Educational Techniques and Their impact in Developing Methodologies of Physical Education in Higher Education. Journal of the University of Kirkuk for Humanitarian Studies Volume: 7, Issue: 3. Retrieved from http://alkhbraa.com/home/PDFs/rasael/tech-info/

[3]. Cuban, L. (2003) Oversold and underused: Computers in the classroom. Cambridge, MA: Harvard University Press.

[4]. Dreaweesh, A. (2003). The impact of using multimedia on the achievement of the second-grade intermediate students in science subject in Al- Riyadh city, Saudi Arabia (Master Thesis). Retrieved from http://alkhbraa.com/home/PDFs/rasael/tech-info

[5]. Eady, M. J. & Lockyer, L. (2013). 'Tools for learning: technology and teaching strategies', Learning to Teach in the Primary School, Queensland University of Technology, Australia. pp. 71.

[6]. Hassett, J. M.; Spuches, C. M.; and Webster, S. P., "Using Electronic Mail for Teaching and Learning" (1995). To Improve the Academy. 333. http://digitalcommons.unl.edu/podimproveacad/333

[7]. Hew, K. F. & Brush, T. (2007). Integrating technology into K–12 teaching and learning: Current knowledge gaps and recommendations for future research. Educational Technology Research & Development, 55(3), 22–52.

[8]. Mohamed, M. (2013). Attitudes of faculty members towards the use of means and techniques of e-learning and its relation to some variables - Faculty of Education Hantoub - University of the Gezira – Sudan. Gezira Journal for Educational and Human Sciences - Volume (10) No. (2), pp. 5-34.

[9]. Mueller, J., Wood, E., Willoughby, T., Ross, C. & Specht, J. (2008). Identifying discriminating variables between teachers who fully integrate computers and teachers with limited

integration. Computers and Education, 51(4), 23–37.

[10]. Nagel, D. (2018). Most Teaching and Learning Uses Technology Nowadays. Retrieved from https://thejournal.com/articles/2018/07/10/study-most-teaching-and-learning-uses-technology-nowadays.aspx?m=1

[11]. Lateh, H. & Raman, A. (2005). A Study on the Use of Interactive Web-Based Maps in the Learning and Teaching of Geography, Malaysian Online Journal of Instructional Technology (MOJIT), 2 (3), 99-105.

[12]. Sadat, A. & Rahman, K. (n. d.). Prospect of Email Communication as an Educational Tool for Distance Education in Bangladesh. Retrieved August 5, 2015 from http://www2.uwstout.edu/content/lib/thesis/2008/2008youngr.pdf

[13]. Sezer, A. (2010). Geography teachers' usage of the INTERNET for the education purposes. International Journal of Progressive Education, 6(3), 38-50.

[14]. Young, R. (2008). Using technology tools in the public school classroom (Master dissertation). Retrieved from: http://www2.uwstout.edu/content/lib/thesis/2008/2008youngr.pdf

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Learning of Poetry Writing High School Students (SMA) : Exploration Study

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ABSTRACT

Based on the results of the study, it was found that in learning to write poetry, Brebes Regency High School students found problems and needs of teachers and students, namely (1) the importance of developing interesting and fun writing poetry learning, (2) the importance of the knowledge learning process in writing poetry (3) There are still teachers who have not applied the right learning model in learning to write poetry, (4) the importance of using appropriate media in learning to write poetry, and (5) the importance of introducing students to multicultural learning in writing poetry. Based on the analysis of the needs of teachers and students the results needed are needed to develop learning to write poetry as follows: (1) easy to use by high school teachers wherever they are, (2) learning that is active, innovative, creative, effective and fun, and (3) improving social sense between friends and training to dare to write poetry with confidence.

Keywords : Learning, Writing Poetry, High School Students

I. INTRODUCTION

Learning is at the core of the overall education process. The quality of teaching and learning is determined by all the components involved in it, especially those in the teaching-learning process, namely teachers and students. This can motivate the teacher to improve the role and competence because the teaching-learning process and student learning outcomes are largely determined by the teacher as the facilitator. Teachers must be able to learn well, especially in developing learning plans. Teachers must be able to carry out creative and innovative learning so that they grow creatively (Mulyaningsih, Suwandi, Setiawan, & Rohmadi, 2018) and have high imaginative power in students who are learning, besides that teachers must be able to provide objective assessments to students.

The success of the teaching-learning process requires the involvement of several elements of teaching, namely teachers, students, subject matter, teaching media, goals, teaching methods, and other supporting facilities. The teaching device cannot stand alone. Each element has its own role in producing the teaching-learning process. Thus, success requires the integrity of each element. The teacher is the main element in learning because the spirit in the classroom in learning is a teacher, it is proper for the teacher to have four teacher competencies, namely pedagogic, professional, personal, and social.

The role of the teacher in teaching and learning activities is not just to convey knowledge to students, but also to provide guidance, direction, motivation, and good character formation. The dominance of teachers in the learning process, especially writing poetry also causes more students not to have a role and passively involved, students are waiting for the offerings from the teacher rather than finding and finding their own knowledge, skills, and attitudes they need. Such conditions do not support the

improvement of the quality of education, especially the quality of teaching Indonesian in learning to write poetry in schools. Is it true that the failure of learning Indonesian especially in writing poetry is caused by the lack of involvement of students in the teaching-learning process, and the lack of proper teaching-learning principles. It is not right if students are not involved in learning, because learning Indonesian primarily achieves the success of four language skills, namely listening, speaking, reading and writing.

Poetry according to the Horace concept, has utile and dulce functions which are useful and enjoyable or entertaining (Teeuw, 1988). Poetry is useful because the process of its creation is through contemplation of life and life so that there is something that the poet wants to convey through his poetry and something that is useful /useful for the reader. Besides being useful, poetry is also entertaining because it is aesthetic and aesthetic poetry can be enjoyed, among others through diction, imagine, concrete words, a figure of speech, verification, and typography.

Until now poetry writing is done in schools and in a number of universities. This happens because learning to write poetry is recognized as having functions and benefits for human life. Poetry writing learning functions to train students' language skills, namely to train imagination in order to be able to pour ideas so that writing skills become more qualified (Mulyaningsih, 2015). Learning to write poetry in high school aims to improve the ability of students to practice sharpening reasoning, imagination, sensitivity to society, culture, and the environment. The material for writing poetry is found in the learning taught in class X, which is to recognize poetry.

Learning to write poetry has tended to be related to natural conditions and romance, besides that the teacher in delivering poetry writing subject matter paid less attention to students having diverse backgrounds, diverse economic status, different tribes, different religions, and competence in writing poetry which is not the same. Students are not directed to create or write multicultural poetry but tend to write poems that are themed (eg the theme of education, heroism, romance, environment) so that what happens is ignoring pluralism and cultural diversity. The multicultural diversity in the classroom is actually a portrait multicultural picture.

Learning to write poetry is an aspect of skill that directs students to practice creative writing. Poetry is a description of various social events, regarding fraud, insult, betrayal, robbery, theft, seizure, desecration, and so on. In addition, the poem also describes joyful events, matters of help, agreement of friendship, romance and so on. These various social events are multicultural phenomena that are interrelated in the student environment, for which learning to write poetry needs to elevate cultural or multicultural diversity in the student environment.

Poetry gives us about human knowledge as social beings, who are involved in social problems. Imaginatively poetry can interpret basic human situations, which can be suffering from injustice, struggle for power, human conflict with fellow human beings, rebellion against God's law or human law itself. Humans as social beings and cultural beings are basically influenced by human values. These values are in the form of ethics that are closely related to morality and aesthetics that are associated with a sense of beauty (Ismawati, 2013).

Learning to write poetry needs to be developed so that students have a high awareness in determining

the most appropriate choices as life guidance in the future with various communication tools. One of them is by integrating on Indonesian language subjects. Thus, learning Indonesian is a medium that can bridge through creative writing skills in high school (SMA) needs to be done because students live in diverse communities. In accordance with the purpose of learning to write poetry, namely to improve students' ability to appreciate literature, multicultural phenomena need to be presented.

Based on the observation of learning from five high schools in Brebes district namely Brebes High School 3, Wanasari High School, Larangan High School, Bulakamba High School, Tanjung High School, it was observed that the quality of learning to write poetry was thematic, and of poor quality. The implementation of learning to write poetry is still dominated by teachers or teacher-centered. Teachers use the lecture method more and theorize, while the condition of students is known to be less active and less interested in learning to write poetry. Students assume that writing poetry is not useful to prepare for their future, so students are less active in issuing their ideas in the practice of writing poetry, besides the situation and condition of students in participating in learning to write poetry is not conducive. Students who sit behind tend to be less concentrated in listening to the teacher's explanation because it begins to not like the practice of writing poetry.

Based on this background, a dissertation study was carried out with the title "Development of Poetry Writing Learning Based on Multicultural Education with the Synectic Model of Brebes Regency High School students" who followed the ten steps of research and development proposed by Borg & Gall (1988) which later by Sukmadinata (2012) modified into four stages, including the exploration phase, development of prototype models, model testing, and dissemination. This paper is part of the research on developing the learning model, namely the exploration phase. The objectives of the exploration phase are (1) Assessing the existence and quality of learning instruments to write poems including syllabus, learning implementation plans, (2) Knowing the poetry writing learning model so far, (3) Assessing the level of teacher needs related to learning to write poetry.

II. METHODS AND MATERIAL

This study uses a qualitative naturalistic descriptive form, namely research whose data is in the form of words, images, and not numbers (Moleong, 2010)The researcher collects as much information as possible related to (1) Planning learning to write poetry in five Brebes district high schools, (2) Implementation of learning to write poetry in five Brebes district high schools, (3) Assessment of poetry writing learning in Brebes high school district. Data collection techniques using observation, interviews, and document analysis.

Observations carried out in a planned and controlled manner by conducting direct observations of the learning process of writing poetry in the classroom. Interviews were carried out structurally with a teacher and student respondents regarding the implementation of learning to write poetry. The collected data was analyzed using the working principle of an interactive analysis model consisting of three activity lines, namely data reduction, data presentation, and drawing conclusions or verification. Data reduction is done by simplifying data obtained from field notes. The goal is to reinforce, shorten, and discard the important things and arrange data in such a way that the conclusions of the research can be done. Data that has been reduced, presented. The next stage is making conclusions.

The study was conducted in five high schools in Brebes district, namely Brebes High School 3, Wanasari High School, Larangan High School, Tanjung High School, Bulakamba High School. The study was conducted in the odd semester of 2015-2016.

III. RESULTS AND DISCUSSION

From the preliminary study found two main problems, namely (1) Problems and needs of teachers in the learning process of writing poetry, and improving learning the learning process of writing poetry, (2) Problems and needs of students in the learning process of writing poetry. Exploration is done to gather information and get input through direct observation and observation, as well as interviews with teachers and students, in five high schools in the Brebes district.

Observation and interview about poetry writing learning for high school students that researchers did for four months starting April to August 2015 in five Brebes high school districts, namely: (1) 3 Brebes public high school, (2) 1 Wanasari public high school, (3) Public high school 1 Bulakamba, (4) 1 Tanjung public high school, (5) Public high school 1 Larangan. During this exploration phase, researchers conducted an in-depth study of the implementation of poetry writing learning in five high schools in the Brebes district. The purpose of the exploration activity is to obtain a comprehensive description of the conditions of learning to write poetry, the needs of students, and the needs of teachers about multicultural education-based poetry writing learning models with synectics
The exploration results in this study were obtained through observation, interviews, and documents about learning models writing poetry as follows like this.

Analysis of Teacher's needs

Problems and needs of teachers and students in learning to write poetry in high school through observation or observation, and interviews. Based on the results of observations and interviews with teachers and students, there are many findings of problems faced by teachers and students in learning to write poetry in high schools in Brebes district, Central Java.

After the researcher conducted an interview with the teacher who teaches Indonesian language subjects and observes the teacher's administration in the classroom, among others, it relates to (1) compiling a lesson plan for writing poetry; (2) application of learning procedures; (3) the application of learning resources and media. First The problems and needs of the teacher in the preparation of the learning implementation plan (RPP) write poetry in high school. Every semester the teacher prepares a learning implementation plan (RPP), which is felt in the preparation of the learning implementation plan is a unique problem for teaching teachers in Indonesian subjects as stated by Rtn, Sc, El, SM, teacher, informant. Based on the results of interviews with informants (teachers) the five of them in learning each semester always make a learning implementation plan (RPP) in accordance with the conditions of the students, and always improve the learning implementation plan (RPP) each subsequent semester. Informant also said almost the same that in compiling the plan for implementing the learning to write poetry varied and many had difficulties.

The difficulty of the teacher in preparing the learning plan is the initial implementation of the 2013 curriculum in Brebes Regency, so there is still doubt, this is because not all teachers of Indonesian language subjects fully understand the application of the 2013

curriculum from planning, learning, and assessment, besides the 2013 curriculum always has improvements. This was revealed by the teacher in the interview notes, that the teacher (the informant) had difficulty compiling a learning implementation plan because the planning of the KTSP curriculum learning was very different, the informant explained, still confusing understanding KI 1, KI 2, KI 3, and KI 4 especially write down the steps of teaching-learning activities.

In line with what was revealed by the teacher Sc, he explained that the preparation of the 2013 curriculum implementation plan was more difficult than the preparation of the KTSP learning implementation plan. This was explained by the informant because it was difficult to connect and choose KI besides the basic competency translation must be written in full.
The problem expressed by the informant (teacher) Ela, which is related to the preparation of a plan for implementing learning about writing poetry, is very difficult to sort out from KI, Basic Competence, Indicators, let alone describe teaching and learning activities. Many teachers felt that delivering poetry writing material received less attention. The teacher said (Tk) "That I myself do not like literary learning material especially writing poetry" then informant explained that when it came to the practice of writing poetry it was difficult to choose beautiful words and find ideas in the practice of writing poetry so that when I delivered writing material My children's poetry told me to explore the practice of writing poetry, sometimes students get out of class to get imagination.

Based on the results of classroom learning observations relating to learning to write poetry, the informants (teachers) were less ready to deliver poetry writing learning material. This was demonstrated by (Ela) the implementation of learning was conventional, meaning that the teacher still dominated learning, besides learning to write dominant poetry in children told to read poetry in the textbook, even though the main material is writing poetry. The results of observations in other schools found that the informant (teacher) seemed nervous in starting the learning process of writing poetry, seemed troublesome to start learning, the teacher was not coherent in conveying the implementation of the learning process, from the implementation the learning process can be concluded that the teacher is less prepared to deliver learning material this because the teacher does not prepare a plan for implementing learning to write poetry so that in the process of implementing learning it seems unprepared.

The informant (the teacher) in preparing the learning implementation plan (RPP) felt that he had been directed and in accordance with the 2013 curriculum but sometimes still felt less confident that the lesson plan he had made was in line with what was expected in the 2013 curriculum, so the informant always tried to improve the implementation plan learning (RPP) well, asking fellow Indonesian language teachers in the same school also asked teacher friends when there was a subject teacher discussion meeting (MGMP).

Secondly, the problems and needs of teachers in the application of learning procedures for writing poetry of high school students. The problem is also faced by teachers in the learning process that is related to the application of learning procedures for writing poetry, researchers find observations in class namely class x public high school 3 Brebes, public high school 1 Bulakamba, Tanjung public high school, state high school Prohibition, and state senior high school 1 The findings have almost the same problem, namely the application of learning procedures. Dominant teachers in applying poetry writing learning students are invited to read poetry in textbooks, students are given

less opportunity to creativity in exploring the learning process of writing poetry, the practice of writing poetry tends to be of the same theme.

The findings of the researchers in conducting classroom observations, teachers (Rt) in the implementation of the learning process of writing poetry began with an explanation of the theory of poetry. The teacher conducts questions and answers about the material to be delivered, the teacher motivates students that writing can practice creativity also adds confidence to writing. The teacher gave examples of poetry works. Another problem related to the interaction of the teacher and students was found by the teacher (Ela) starting by directly reading poetry in the class so the students were shocked full of question marks about what material this morning, after the teacher finished reading a poem the teacher explained about the theory of how to write good poetry. The researcher found that in the implementation of the learning process the teacher paid little attention to the introduction of learning.

From the observation findings when the learning took place it turned out that the teachers in the learning process of writing poetry were still dominated by the teacher, the students were not given the opportunity to explore based on their creativity. In addition, even though the material is about writing poetry, it is still the dominant explanation and example of poetry reading in the textbook. Related to the utilization of the teacher's time to learn by giving homework about writing poetry, thus when researchers conduct learning observations the teacher tends to discuss the theory of writing poetry. The teacher (informant) always gives the task of writing poetry individually after the poetry writing material has finished.

Third, the problems and needs of teachers in determining the media and sources of learning to write poetry. The media and learning resources are very helpful in the learning process because it will help students more quickly understand the learning material. Researchers conduct observations in several learning media schools are considered less important. This is indicated by the teacher not using visual media, audio media, especially audio-visual media. After the researchers interviewed several informants (teachers) they felt troubled and difficult if teaching had to prepare many things including preparing learning media. Other findings in the same place there are still students who are less focused on learning to write poetry so the class is rather noisy. This researcher found that the absence of media made the concentration of students less focused and less attractive. According to the informant (Tk) when delivering poetry writing material, never used the media but students introduced nature or the environment as a direct media to get poetry writing imagination.

The source of learning is found to be monotonous, that is, only struggling from the source of textbooks or textbooks, the teacher does not give the opportunity to students that the source of learning related to writing poetry is very much including the universe, magazines, journals and so on.

Fourth, the problem of learning material in writing poetry, based on the results of interviews with dominant informants (teachers), teachers lack understanding of multicultural based learning, especially learning to write poetry based on multicultural learning. As stated by Informant (Rt) I have heard of multiculturalism but in literary learning especially writing poetry has never been applied, the informant did thematically according to the mandate of the 2013 curriculum. There was also a word multicultural but never applied in learning. Indonesian mainly writes poetry. Informant (St) said

that multicultural based learning had never been applied in learning, especially writing poetry, so it still felt strange. The statement of the informant (Tk) has clearly never practiced multicultural education-based learning, let alone learning to write poetry. Informant said that what was known to be multicultural was related to culture, for example, Javanese cultures such as the seven months of a woman who was pregnant from which students were told to write poetry. Thus the informant explained that learning to write poetry is still thematic.

The five problems and needs of the teacher relate to the application of the model, based on the results of interviews with several informants in learning, have implemented learning models, but completely have not applied syntax in a coherent manner according to the model used. Some informants explained almost the same name the teacher had practiced the learning model even though it was not obedient to the syntax, besides the teacher (informant) did not understand what model I applied to the students, the informant thought that the child was active and could write poetry easily and with quality. In addition, in general, the informant said that the synectic model had never been applied, even though it had only been heard of the synectic model.

According to the information statement (Sc), I have often applied the learning model but the synectic model does not understand at all, besides the application of the model sometimes arises from its own ideas which are important for children to understand well. In line with informant (St), I applied to learn outside the classroom to see nature and the environment, and then students started writing poetry, I did not understand what the model was going on, moreover the synectic model did not understand, I hope there will be examples of learning to write poetry based on multicultural with a synectic model. The same statement was conveyed by informant (Tk) students I often invited out of class to see the scenery to get imagination so that students easily practice writing poetry only that but do not understand what model or name is used, but informants do not expect syntax clearly. Regarding the informant's synectic model, he just heard, honestly the informant had never applied the synectic model in learning to write poetry.

Analysis of Student Needs

First, the problems and needs of high school students in Poetry Writing Learning. Based on the results of interviews and observations in the learning process in the classroom, the researcher found various problems as follows: (1) The majority of students said learning to write poetry was fun but for students it was difficult to find ideas or ideas, students found it difficult to choose beautiful words, especially enter figure of speech. Based on what was conveyed by students from several schools proving that learning to write poetry was felt fun but difficult and difficult, according to what was expressed by students (Dani) literary learning was fun but "learning to write poetry I did not like because I could not express ideas or ideas, and the difficulty of choosing beautiful words. " Similar to what was expressed by students (Jono) from different schools "learning to write poetry has been studied since elementary school, junior high school but in high school learning to write poetry still finds it difficult to pour die or ideas, and choose the right words for poetry. Also revealed by students (Siti) from a different high school".

Learning to write poetry is fun but to pour die or difficult ideas. From some expressions, students from different schools prove that learning to write poetry is fun but difficult and precise. (2) Writing poetry is difficult for non-talented students. The next finding is

the problem of students' interests and talents said to greatly affect the success of students in the practice of writing poetry, this is proven by several expressions from students, among others; students (Mira) "said that whenever there is literary material, especially writing poetry, I do not have the enthusiasm to follow class learning because I do not have the talent to write poetry, difficult to express ideas or ideas, let alone choose the right and beautiful words so that every time I write poetry the results are not good ". As expressed by students (Dani) from high school different" my talent is music so it seems not interested in learning to write poetry ". Students (Ani) revealed, "actually I like to write poetry but I don't have the talent to write poetry". In accordance with the expressions of the informants (students) talents are said to determine the success of students in learning to write poetry. (3) Learning to write poetry does not interest many students. With regard to learning to write poetry that is not in demand by students is a challenge for Indonesian teachers, according to the expressions of high school students (Tatik) "Every learning to write poetry students feel unhappy because they are considered to be a waste of time and has no benefit". Students (Hari) also revealed the same problem "learning to write poems is useless is just a waste of time". Different high school students (Kiswanto) revealed "learning is important both knowledge, skills, and attitudes, but the knowledge that can be for the future of life while learning to write poetry cannot guarantee success in life".

IV. CONCLUSION

From result and analysis can be conclus that (1) the importance of developing interesting and fun writing poetry learning, (2) the importance of the knowledge learning process in writing poetry (3) There are still teachers who have not applied the right learning model in learning to write poetry, (4) the importance of using appropriate media in learning to write poetry, and (5) the importance of introducing students to multicultural learning in writing poetry. Based on the analysis of the needs of teachers and students the results needed are needed to develop learning to write poetry as follows: (1) easy to use by high school teachers wherever they are, (2) learning that is active, innovative, creative, effective and fun, and (3) improving social sense between friends and training to dare to write poetry with confidence.

V. REFERENCES

[1]. Borg, W. R & Gall, M. D. (1988). Educational Research: An Introduction. New York: Longman.

[2]. Ismawati, E. (2013). Pengajaran Sastra. Yogyakarta: Ombak.

[3]. Moleong, L. J. (2010). Metode Penelitian Kualitatif. Edisi Revisi. Bandung: Remaja Rosdakarya.

[4]. Mulyaningsih, I. (2015). Sastra Anak: Pengembangan Kreativitas melalui Puisi dan Pantun. Cirebon: Nurjati Press.

[5]. Mulyaningsih, I., Suwandi, S., Setiawan, B., & Rohmadi, M. (2018). PARMI (production, attention, retention, motivation, and innovation): An alternative to improving scientific writing skills. Lingua Cultura, 12(4), 317-321. https://doi.org/10.21512/lc.v12i4.4159

[6]. Sukmadinata, N. S. (2008). Metode Penelitian Pendidikan.Bandung: PT Remaja Rusdakarya

[7]. Teeuw, A. (1988). Sastra dan Ilmu Sastra: Pengantar Teori sastra. Cet. Ke 2. Jakarta : Pustaka Jaya.

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Green Synthesis of Copper Nanoparticles Using *Mitragyna Parvifolia* Bark Extract and its Antimicrobial Study

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ABSTRACT

In this study, *Mitragyna parvifolia* plant bark an aqueous extract which provides cost-effective, eco-friendly process, less time consuming, an environmentally benign, easy and proficient way for the synthesis of copper nanoparticles. *Mitragyna parvifolia* plant bark was collected from virpur hills forest area. The *Mitragyna parvifolia* plant bark extract was prepared in de-ionised water and used for the green synthesis of copper nanoparticles. The color change of the solution dark brown from pale yellow colored, this confirms that there is a formation of copper nanoparticles. The green synthesised copper nanoparticles were characterized by UV-Visible spectroscopy, FT-IR, XRD, SEM, TEM and their antimicrobial activity was investigated. From UV-Visible spectrophotometer result was confirmed the reduction of copper sulphate to copper nanoparticles. FTIR analysis was confirmed the bending vibrations and stretching bonds present in the sample. Spherical shape was finding out by XRD and the size of the particle was analyzed with the help of Scanning Electron Microscopy. The antibacterial activity experiment against *Escherichia coli* gram-negative and *Bacillus subtilis* gram-positive bacteria by agar well method and the maximum zone of inhibition was higher in gram-positive bacteria compared to gram-negative bacteria. The green synthesised copper nanoparticles proved to be potential candidates for medical application antimicrobial activity is highly essential.

Keywords : Copper nanoparticles, Green synthesis, UV, FTIR, XRD, SEM, TEM, Antimicrobial Activity

I. INTRODUCTION

Nanotechnology has involved many researchers from different field like chemistry, physics, biotechnology, material science, engineering, medicine, pharmaceutical etc. Copper Nanoparticles synthesised by many ways such as biological method, chemical method, physical method, sol-gel method, solid-state reaction, co-precipitation, vapour deposition[1], electrochemical reduction[2], radiolysis reduction[3], thermal decomposition[4] and chemical reduction of copper metal salt[5]. green synthesis method has so many advantages compared to other methods and one of the best method because it is cost-effective, simple, use of low energy, use of less toxic materials and eco-friendly[6-7]. The copper nanoparticles are mostly found their applications in the field of medical, electronic devices, biosensors, and reagents in various reactions, lubricants, antibiotic, antimicrobial agents and many more.

The *Mitragyna parvifolia* is a tree belongs to *Rubiaceae* family, plant species are used medicinally and their height of 50 feet with a branch spread over 15 feet and a stem is erect and branching, flowers are yellow and grow in ball-shaped clusters, dark green in colour leaves smooth and round in shape[8]. The Medicinal plant has contained a variety of phytopharmaceuticals found very important applications of in the area of agriculture, human and

veterinary medicine and novel drug for the treatment and prevention of disease[9]. The plant bark and roots are used in the treatment of fiver, colic, muscular pain, burning sensation, poisoning, gynaecological disorders, cough, oedema and fruit juice augments the breast milk in lactating mothers[10].

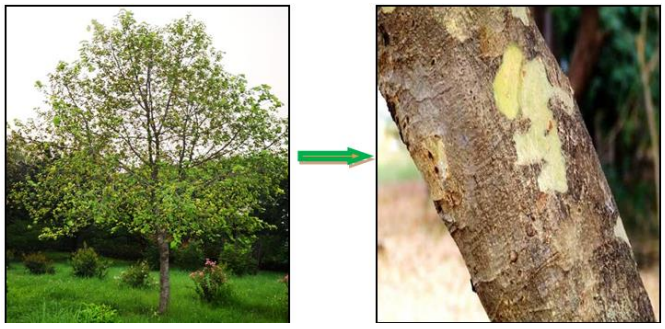


Fig.1 Bark of Mitragyna parvifolia plant

II. METHODS AND MATERIAL

2.1. MATERIALS

The plant Mitragyna parvifolia material was collected from Virpur hills and forest, sabarkantha district, Gujarat. Ultra-pure deionised water used in entire research. Analytical A grade copper sulphate was purchased Sigma-Aldrich Chemicals.

2.2. PREPARATION OF M. PARVIFOLIA BARK EXTRACT

Collected plant bark first washes tap water then again washes with double distilled water and dry it at room temperature for 15-20 days. After dried bark, it was converting into powder form by using a grinder and collects it in neat and clean dry air tight bottle for use of research. Weigh 10 gm of powder takes in 250 ml conical flask and add 100 ml deionised water after that conical flask put on magnetic stirrer and stir for 30 min at 60oC. The extract was cool down at room temp and filtered with whatman no.1 filter paper and the filtrate obtained was store at room temp at the dark place for further use.

2.3. SYNTHESIS OF COPPER NANOPARTICLES

The reaction mixture was prepared by 10 ml of M. parvifolia extract was added to 90 ml of an aqueous copper sulphate solution in a 250 ml conical flask. After that, the solution colour changed pale yellow from blue when the solution of M. parvifolia extract and copper sulphate were stirred on the magnetic stirrer for a homogeneous mixture. After that, the flask was kept at room temperature for incubation around 24 hours and the colour was changed turn into dark brown from pale yellow11.

2.4. PURIFICATION OF COPPER NANOPARTICLES

The reaction mixture was centrifuged at 10,000 rpm for 15 min followed by dispersion of the pellet in deionised water and the CuNPs were dried in an oven at 80oC for 4-5 hours12.

2.5 CHARACTERIZATION OF PREPARED COPPER NANOPARTICLES

2.5.1. UV-VISIBLE SPECTROPHOTOMETER ANALYSIS

The green synthesized CuNPs characterization was monitored by Shimadzu 1800 UV-Visible spectrophotometer in the wavelength range of 300-700 nm. 2 mm caveat and double distilled water were utilized for blank reading.

2.5.2. FT-IR SPECTROSCOPY ANALYSIS

The Fourier Transform Infrared spectra were identified by an FT-IR spectrophotometer (Perkin Elmer Spectrum) using KBr. The sample powder was

mixed with KBr and prepared pallet scanned at the range of 4000-450 cm-1.

2.5.3. X-RAY DIFFRACTION (XRD) ANALYSIS

The X-ray diffraction was used to obtaining the crystalline structure and data in the 2θ range of 20o-80o.

The Debye Scherrer formula,

$$D=k\lambda/\beta\cos\theta$$

Where,

D = particle diameter size
K = constant equals 1
λ = wavelength of X-ray source
β = the full width at half maximum of the diffraction peak
θ = the Bragg angle

2.5.4. SCANNING ELECTRON MICROSCOPY (SEM) ANALYSIS

The surface morphology of CuNPs was analyzed by scanning electron microscope it was performed by SIGMA model and an operating on the voltage of 20 kV and for operation need a very small amount of dry powder sample put on a grid and removed excess sample with the help of blotting paper.

2.5.5. TRANSMISSION ELECTRON MICROSCOPY (TEM) ANALYSIS

TEM analysis characterizes the size, shape and morphology of the copper nanoparticles and a prepared sample was dried under vacuum in desiccators before placing it in a specimen holder. A thin sample was irradiated with a sharp high-energy electron beam focused by magnetic lance and electron intensity distribute on the beam after interaction with sample and image was recorded by digital camera and display on a computer screen17.

2.6. ANTIMICROBIAL ACTIVITY

2.6.1. TEST ORGANISM FOR ANTIBACTERIAL ACTIVITY

In this study, two type bacteria were collected from the microbiology department, HNGU. One was gram-positive bacteria and another one was gram-negative, Bacillus subtilis (+ve) and Escherichia coli (-ve). The bacterial strains were grown and maintained on nutrient agar at 38oC in incubation condition for 5 days and the culture was stored at 4oC for further experiment work.

2.6.2. MEDIA PREPARATION

In the media preparation, B. subtilis and E. coli bacteria were grow in a nutrient agar medium. 2.8 gm nutrient agar powder was added into 100 ml of distilled water for nutrient agar preparation then the prepared medium was kept in the cotton-plugged glass container and sterilized in the autoclave at 120oC for 20 min.

2.6.3. METHOD FOR TESTING ANTIMICROBIAL ACTIVITY OF SYNTHESISED COPPER NANOPARTICLES

Antimicrobial activity of green synthesised copper nanoparticles was carried out by agar disc diffusion method 13-15 against B. subtilis (+ve) and E. coli (-ve) bacteria.

The nutrient agar plates were prepared by 20ml for each of molten media into sterile Petri-plates. Plates were left standing for 10 minutes to let the culture get absorbed.

Using the micro-pipette, 100µl of the sample of Nanoparticles suspension was poured into different concentration (25µl, 50µl, 75µl) into each plate. Then Antibiotic-Ampicillin drug was used as positive

control. After adding the samples in the wells, the dishes were kept in a refrigerator for an hour for absorption of the samples into the surrounding medium from the well. The plates were transferred into an incubator set at 37°C to allow bacterial growth on the medium. After 24 hrs the plates were taken out of the incubator and observed for the zone of bacterial growth inhibition around the wells. The zone of inhibition was measured in millimeters16.

III. RESULTS AND DISCUSSION

3.1. Color change

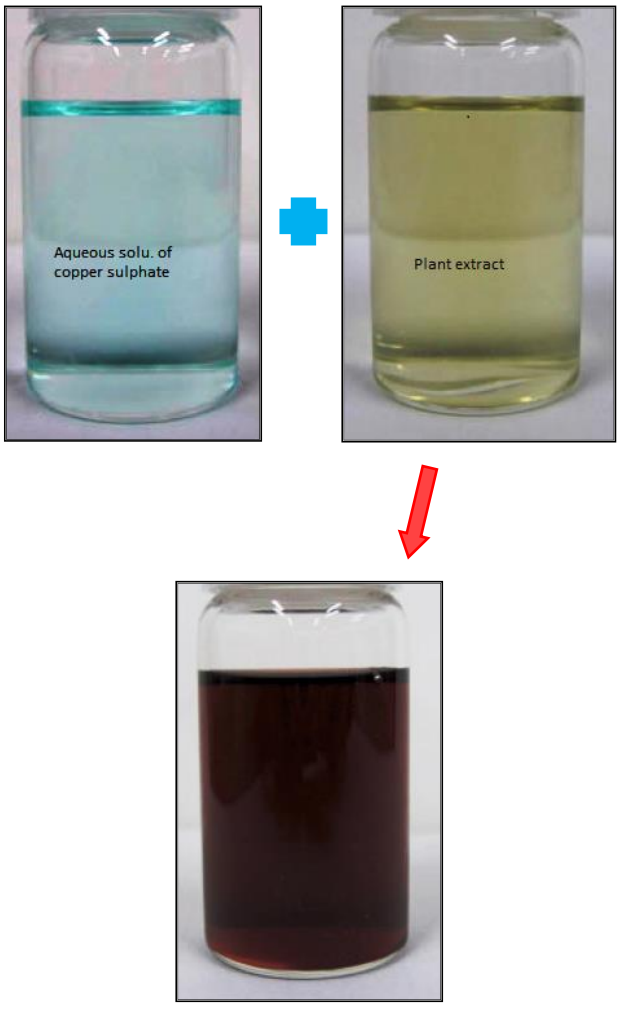


Fig. 2 Aqueous solu. of copper sulphate + plant extract = after synthesis of CuNPs

3.2. UV-visible Spectroscopy

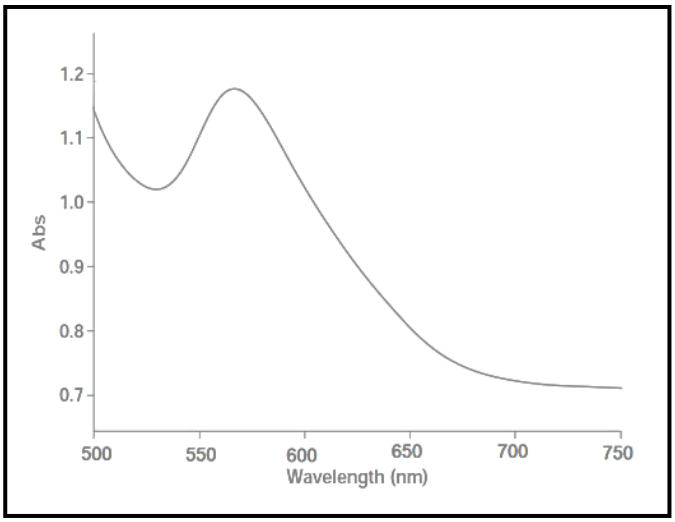


Fig. 3. UV-visible spectra of copper Nanoparticles

The characterization of copper Nanoparticles by UV-Vis spectra from the range of 500-750 nm the absorption spectra were obtained at 565-570 nm in graph represent.

3.3. Fourier Transform Infrared Spectroscopy (FTIR)

FTIR gives the information about present functional groups in synthesised copper nanoparticles and it shows in (fig. 4) clearly. In the spectra the peak at 3298.28 cm^{-1} and 3324.21 cm^{-1} indicating the presence of –NH or –OH group stretching in amino acids alcohols and phenols, Stretching at 2926.01 cm^{-1} corresponds to C-H stretching in alkanes and aldehydes, stretching at 1648.12 cm-1 indicate the presence of >C=O group and the peak at 1103.28 cm^{-1} corresponds to C-O stretching and the weak peaks in between 850.61 cm^{-1} to 526.57 cm^{-1} are associated to halo compounds stretching[18-19]. Hence these observations indicated the formation of CuNPs associated with metabolites protein like terpenoids contain functional groups as alcohols, phenols aldehydes, ketones and carboxylic acids. Kulkarni et al reported the bio-entities could probably play a double role of fabrication and stabilization of copper nanoparticles in the aqueous solution[20].

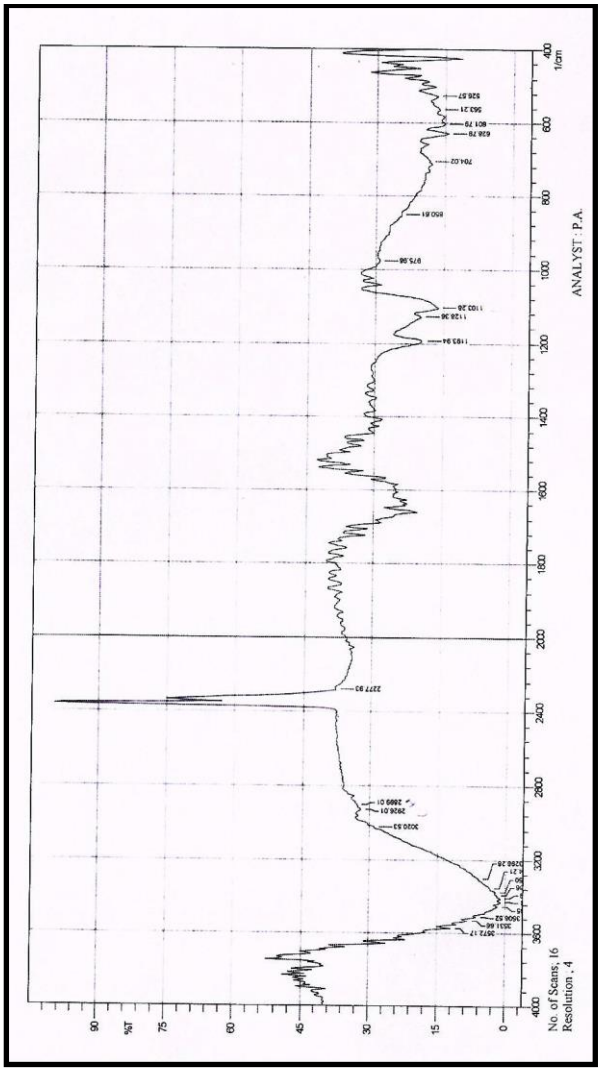


Fig. 4. FTIR spectra of copper nanoparticles

3.4 X-ray diffraction

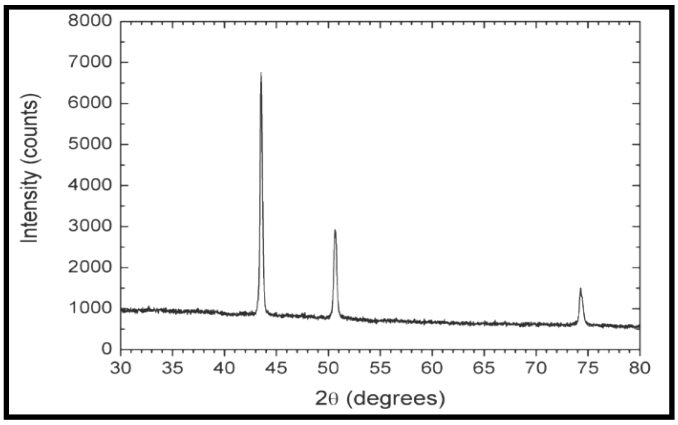


Fig.5. X-ray diffraction pattern of copper nanoparticles

In the X-ray diffraction study all the peaks observed 2Θ value at 43.31°, 50.55° and 74.27° representing the (111), (200), and (220), morphology of the interplanar distance spacing was calculated by using Bragg's equation.

3.5. Scanning Electron Microscopy SEM analysis

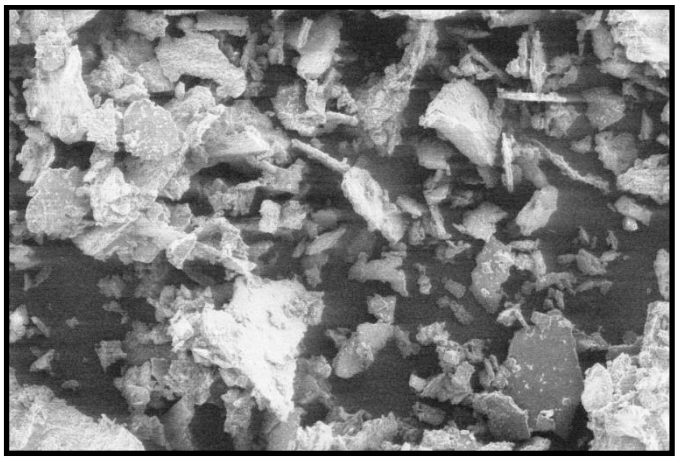


Fig.6. SEM analysis of copper nanoparticles

The copper nanoparticles size determined by scanning electron microscope image, in the surface morphology study of CuNPs average size was 23.6 – 41.2 nm; (fig. 6) shows the existence of symmetrical spherical shape. The electronic interaction and hydrogen bond between the bio-organic molecules bond are responsible for the synthesis of copper nanoparticles using plant extract[21].

3.6 Transmission Electron Microscopy (TEM) analysis

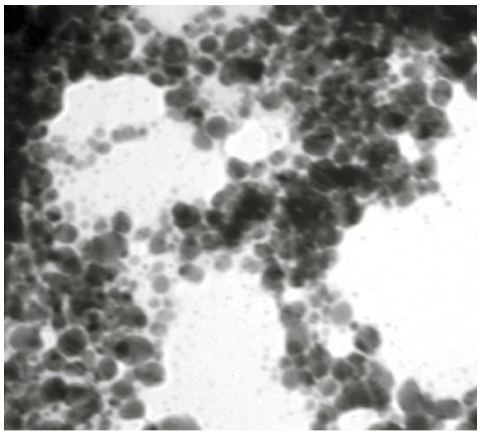
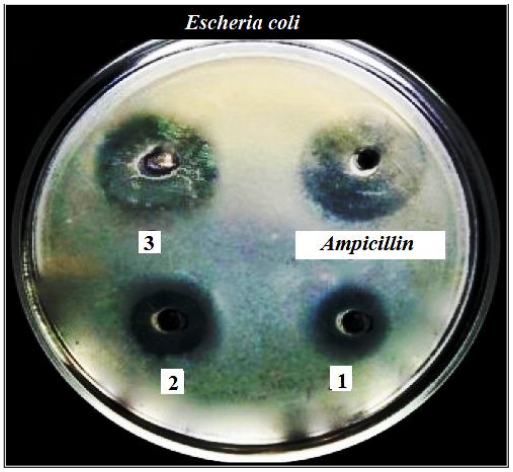


Fig.7. TEM analysis of copper nanoparticles

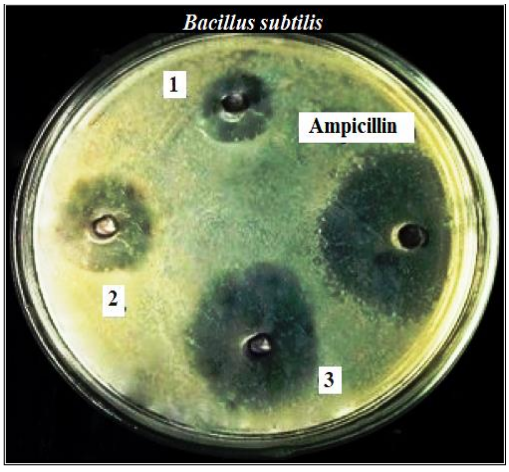
The image of Silver nanoparticles synthesised using an aqueous extract of (plant name) shown in (fig. 7) the synthesized CuNPs was spherical in shape and an average diameter of 12-23 nm. Singh et al have reported a similar geometry of synthesized silver and gold nanoparticles using natural precursor clove[22].

3.7 Antimicrobial activity

The antimicrobial activity of green synthesised copper nanoparticles against two human pathogenic bacteria such as Bacillus subtilis and Escherichia coli. Here Bacillus subtilis is gram +ve and Escherichia coli is gram –ve bacteria were evaluated and compared to a commercial antibiotic drug ampicillin. Synthesised CuNPs showed the clear diameter of the zone of inhibition around the well wherein the suspension of CuNPs was applied. The obtained result was presented in table (A) and figure 8.



(a)



(b)

Fig. 8. antibacterial activities of CuNPs (a) Escherichia coli and (b) Bacillus subtilis compared to a commercial antibiotic drug Ampicillin drug

Table (a). The Zone of inhibition area (mm) exhibited by the formed CuNPs against pathogenic bacteria

Concentration (µl)	Diameter of zone of inhibition (mm)	
	Escherichia Coli	Bacillus Subtilis
25 µl	6.80	9.50
50 µl	10.00	13.80
75 µl	13.80	17.50
Standard Drug Ampicillin	16.00	20.00

IV. CONCLUSION

In this study, green synthesis of copper Nanoparticles was successfully synthesized by using *Mitragyna parvifolia* plant bark an aqueous extract which provides cost-effective, eco-friendly process, less time consuming, an environmentally benign, easy and proficient way for the synthesis of copper nanoparticles. The green synthesised copper nanoparticles were characterized by UV-Visible spectroscopy, FT-IR, XRD, SEM, TEM and their antimicrobial activity was investigated. From UV-Visible spectrophotometer result was confirmed the reduction of copper sulphate to copper nanoparticles. FTIR analysis was confirmed the bending vibrations and stretching bonds present in the sample. Spherical shape was finding out by XRD and the size of the particle was analyzed with the help of Scanning Electron Microscopy and it was an average size of 23.6 - 41.2 nm. The antibacterial activity for the

synthesised copper nanoparticles was confirmed by the antibacterial activity experiment against *Escherichia coli* gram-negative and *Bacillus subtilis* gram-positive bacteria by agar well method and the maximum zone of inhibition was higher in gram-positive bacteria compared to gram-negative bacteria. The green synthesised copper nanoparticles proved to be potential candidates for medical application antimicrobial activity is highly essential.

V. REFERENCES

[1]. Choi, Hyungsoo, and Sung-Ho Park. "Seedless growth of free-standing copper nanowires by chemical vapor deposition." Journal of the American Chemical Society 126, no. 20 (2004): 6248-6249.

[2]. Huang, Lina, Heqing Jiang, Jisheng Zhang, Zhijun Zhang, and Pingyu Zhang. "Synthesis of copper nanoparticles containing diamond-like carbon films by electrochemical method." Electrochemistry Communications 8, no. 2 (2006): 262-266.

[3]. Joshi, S. S., S. F. Patil, V. Iyer, and S. Mahumuni. "Radiation induced synthesis and characterization of copper nanoparticles." Nanostructured materials 10, no. 7 (1998): 1135-1144.

[4]. Dhas, N. Arul, C. Paul Raj, and A. Gedanken. "Synthesis, characterization, and properties of metallic copper nanoparticles." Chemistry of materials 10, no. 5 (1998): 1446-1452.

[5]. Hashemipour, Hassan, Maryam Ehtesham Zadeh, Rabee Pourakbari, and Payman Rahimi. "Investigation on synthesis and size control of copper nanoparticle via electrochemical and chemical reduction method." International Journal of Physical Sciences 6, no. 18 (2011): 4331-4336.

[6]. Saranyaadevi, K., V. Subha, RS Ernest Ravindran, and S. A. H. A. D. E. V. A. N. Renganathan. "Green synthesis and characterization of silver nanoparticle using leaf extract of Capparis zeylanica." Asian J. Pharm. Clin. Res 7 (2014): 44-48.

[7]. Yamini SudhaLakshmi, G., Fouzia Banu, and Arumugam Ezhilarasan. "Sahadevan. Green Synthesis of Silver Nanoparticles from Cleome Viscosa." Synthesis and Antimicrobial Activity 5 (2011).

[8]. "Mitragyana parvifolia- kaim, www. Flowersofindia.net.retrieved, (2016): 11-03.

[9]. Pence, Laura E., and Mary M. Kirchhoff. "ConfChem Conference on Educating the Next Generation: Green and Sustainable Chemistry Green Chemistry and Sustainability through the American Chemical Society Education Division and Committee on Environmental Improvement." Journal of Chemical Education 90, no. 4 (2013): 510-512.

[10]. Gong, Fang, Hai-peng Gu, Qi-tai Xu, and Wen-yi Kang. "Genus Mitragyna: Ethnomedicinal uses and pharmacological studies." Phytopharmacology 3, no. 2 (2012): 263-272.

[11]. Saranyaadevi, K., V. Subha, RS Ernest Ravindran, and S. Renganathan. "Synthesis and characterization of copper nanoparticle using Capparis zeylanica leaf extract." Int J Chem Tech Res 6, no. 10 (2014): 4533-4541.

[12]. Das, Sreemanti, Jayeeta Das, Asmita Samadder, Avijit Paul, and Anisur Rahman Khuda-Bukhsh. "Efficacy of PLGA-loaded apigenin nanoparticles in Benzo [a] pyrene and ultraviolet-B induced skin cancer of mice: Mitochondria mediated apoptotic signalling cascades." Food and chemical toxicology 62 (2013): 670-680.

[13]. Shanmuga Priya, K., A. Gnanamani, N. Radhakrishnan, and Mary BABU. "Antibacterial activity of Datura alba." Indian drugs 39, no. 2 (2002): 113-116.

[14]. Ahmad, Naheed, Seema Sharma, V. N. Singh, S. F. Shamsi, Anjum Fatma, and B. R. Mehta. "Biosynthesis of silver nanoparticles from Desmodium triflorum: a novel approach towards weed utilization." Biotechnology Research International 2011 (2011).

[15]. Li, Zhi, Daeyeon Lee, Xiaoxia Sheng, Robert E. Cohen, and Michael F. Rubner. "Two-level antibacterial coating with both release-killing and contact-killing capabilities." Langmuir 22, no. 24 (2006): 9820-9823.

[16]. Donda, Manisha R., Karunakar Rao Kudle, Jahnavi Alwala, Anila Miryala, B. Sreedhar, and MP Pratap Rudra. "Synthesis of silver nanoparticles using extracts of Securinega leucopyrus and evaluation of its antibacterial activity." Int J Curr Sci 7 (2013): 1-8.

[17]. Joseph, Akansha Treeza, P. Prakash, and S. S. Narvi. "Phytofabrication and Characterization of Copper Nanoparticles Using Allium Sativum and its Antibacterial Activity." IJSET 4 (2016): 463-473.

[18]. S.D. Ashtaputrey, P.D. Asthaputry and Neha Telane, green synthesis and characterisation of copper nanoparticles derived from Murraya Koenigii leaves extract, Journal of Chemical and Pharmaceutical Sciences, 2017, 10(3), 1288-1291.

[19]. Valli, G., and S. Geetha. "Green Synthesis of Copper Nanoparticles using Cassia Auriculata Leaves Extract." International journal of technochem. Research 2, no. 1 (2016): 05-1

[20]. Kulkarni, V., and P. Kulkarni. "Synthesis of copper nanoparticles with aegle marmelos leaf extract." Nanosci Nanotechnol 8 (2014): 401-404.

[21]. Joseph, Akansha Treeza, P. Prakash, and S. S. Narvi. "Phytofabrication and Characterization of Copper Nanoparticles Using Allium Sativum and its Antibacterial Activity." IJSET 4 (2016): 463-473.

[22]. Singh, Ashwani Kumar, Mahe Talat, D. P. Singh, and O. N. Srivastava. "Biosynthesis of gold and silver nanoparticles by natural precursor clove and their functionalization with amine group." Journal of Nanoparticle Research 12, no. 5 (2010): 1667-1675

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Decentralized Access Control with Anonymous Authentication of Data Stored in Clouds

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ABSTRACT

The paper proposes a new decentralized access control scheme for secure data storage in clouds that supports anonymous authentication. In the proposed scheme, the cloud verifies the authenticity of the series without knowing the user's identity before storing data. Our scheme also has the added feature of access control in which only valid users are able to decrypt the stored information. The scheme prevents replay attacks and supports creation, modification, and reading data stored in the cloud. We also address user revocation. Moreover, our authentication and access control scheme are decentralized and robust, unlike other access control schemes designed for clouds which are centralized. The communication, computation, and storage overheads are comparable to centralized approaches.

Keywords : Dependable Cloud Storage, Decentralized Access Control Scheme.

I. INTRODUCTION

Research in cloud computing is receiving a lot of attention from both academic and industrial worlds. In cloud computing, users can outsource their computation and storage to servers (also called clouds) using Internet. This frees users from the hassles of maintaining resources on-site. Clouds can provide several types of services like applications (e.g., Google Apps, Microsoft online), infrastructures (e.g., Amazon's EC2, Eucalyptus, Nimbus), and platforms to help developers write applications (e.g., Amazon's S3, Windows Azure).

Much of the data stored in clouds is highly sensitive, for example, medical records and social networks. Security and privacy are thus very important issues in cloud computing. In one hand, the user should authenticate itself before initiating any transaction, and on the other hand, it must be ensured that the cloud does not tamper with the data that is outsourced. User privacy is also required so that the cloud or other users do not know the identity of the user. The cloud can hold the user accountable for the data it outsources, and likewise, the cloud is itself accountable for the services it provides. The validity of the user who stores the data is also verified. Apart from the technical solutions to ensure security and privacy, there is also a need for law enforcement.

Recently, Wang et al. [2] addressed secure and dependable cloud storage. Cloud servers prone to Byzantine failure, where a storage server can fail in arbitrary ways [2]. The cloud is also prone to data modification and server colluding attacks. In server colluding attack, the adversary can compromise storage servers, so that it can modify data files as long as they are internally consistent. To provide secure

data storage, the data needs to be encrypted. However, the data is often modified and this dynamic property needs to be taken into account while designing efficient secure storage techniques.

Efficient search on encrypted data is also an important concern in clouds. The clouds should not know the query but should be able to return the records that satisfy the query. This is achieved by means of searchable encryption [3], [4]. The keywords are sent to the cloud encrypted, and the cloud returns the result without knowing the actual keyword for the search. The problem here is that the data records should have keywords associated with them to enable the search. The correct records are returned only when searched with the exact keywords.

Security and privacy protection in clouds are being explored by many researchers. Wang et al. [2] addressed storage security using Reed-Solomon erasure-correcting codes. Authentication of users using public key cryptographic techniques has been studied in [5]. Many homomorphic encryption techniques have been suggested [6], [7] to ensure that the cloud is not able to read the data while performing computations on them. Using homomorphic encryption, the cloud receives ciphertext of the data and performs computations on the ciphertext and returns the encoded value of the result. The user is able to decode the result, but the cloud does not know what data it has operated on. In such circumstances, it must be possible for the user to verify that the cloud returns correct results.

Accountability of clouds is a very challenging task and involves technical issues and law enforcement. Neither clouds nor users should deny any operations performed or requested. It is important to have log of the transactions performed; however, it is an important concern to decide how much information to keep in the log. Accountability has been addressed in TrustCloud [8]. Secure provenance has been studied in [9].

Considering the following situation: A Law student, Alice, wants to send a series of reports about some malpractices by authorities of University X to all the professors of University X, Research chairs of universities in the country, and students belonging to Law department in all universities in the province. She wants to remain anonymous while publishing all evidence of malpractice. She stores the information in the cloud. Access control is important in such case, so that only authorized users can access the data. It is also important to verify that the information comes from a reliable source. The problems of access control, authentication, and privacy protection should be solved IEEE TRANSACTIONS ON PARALLEL AND DISTRIBUTED SYSTEMS VOL:25 NO:2 YEAR 2014 2 simultaneously. We address this problem in its entirety in this paper.

Access control in clouds is gaining attention because it is important that only authorized users have access to valid service. A huge amount of information is being stored in the cloud, and much of this is sensitive information. Care should be taken to ensure access control of this sensitive information which can often be related to health, important documents (as in Google Docs or Dropbox) or even personal information (as in social networking). There are broadly three types of access control: User Based Access Control (UBAC), Role Based Access Control (RBAC), and Attribute Based Access Control (ABAC). In UBAC, the access control list (ACL) contains the list of users who are authorized to access data. This is not feasible in clouds where there are many users. In RBAC (introduced by [10]), users are classified based on their individual roles. Data can be accessed by

users who have matching roles. The roles are defined by the system. For example, only faculty members and senior secretaries might have access to data but not the junior secretaries. ABAC is more extended in scope, in which users are given attributes, and the data has attached access policy. Only users with valid set of attributes, satisfying the access policy, can access the data. For instance, in the above example certain records might be accessible by faculty members with more than 10 years of research experience or by senior secretaries with more than 8 years experience. The pros and cons of RBAC and ABAC are discussed in [11]. There has been some work on ABAC in clouds (for example, [12], [13], [14], [15], [16]). All these work use a cryptographic primitive known as Attribute Based Encryption (ABE). The The eXtensible Access Control Markup Language (XACML) [17] has been proposed for ABAC in clouds [18].

An area where access control is widely being used is health care. Clouds are being used to store sensitive information about patients to enable access to medical professionals, hospital staff, researchers, and policy makers. It is important to control the access of data so that only authorized users can access the data. Using ABE, the records are encrypted under some access policy and stored in the cloud. Users are given sets of attributes and corresponding keys. Only when the users have matching set of attributes, can they decrypt the information stored in the cloud. Access control in health care has been studied in [12], [13].

Access control is also gaining importance in online social networking where users (members) store their personal information, pictures, videos and share them with selected groups of users or communities they belong to. Access control in online social networking has been studied in [19]. Such data are being stored in clouds. It is very important that only the authorized users are given access to those information. A similar situation arises when data is stored in clouds, for example in Dropbox, and shared with certain groups of people.

It is just not enough to store the contents securely in the cloud but it might also be necessary to ensure anonymity of the user. For example, a user would like to store some sensitive information but does not want to be recognized. The user might want to post a comment on an article, but does not want his/her identity to be disclosed. However, the user should be able to prove to the other users that he/she is a valid user who stored the information without revealing the identity. There are cryptographic protocols like ring signatures [20], mesh signatures [21], group signatures [22], which can be used in these situations. Ring signature is not a feasible option for clouds where there are a large number of users. Group signatures assume the pre-existence of a group which might not be possible in clouds. Mesh signatures do not ensure if the message is from a single user or many users colluding together. For these reasons, a new protocol known as Attribute Based Signature (ABS) has been applied. ABS was proposed by Maji et al. [23]. In ABS, users have a claim predicate associated with a message. The claim predicate helps to identify the user as an authorized one, without revealing its identity. Other users or the cloud can verify the user and the validity of the message stored. ABS can be combined with ABE to achieve authenticated access control without disclosing the identity of the user to the cloud.

II. IMPLEMENTATION

A. Modules Description

i. Encryption / Decryption

We used RSA algorithm for encryption/Decryption. This algorithm is the proven mechanism for secure

transaction. Here we are using the RSA algorithm with key size of 2048 bits. The keys are split up and stored in four different places. If a user wants to access the file he/she may need to provide the four set of data to produce the single private key to manage encryption/decryption.

B. File Upload / Download

File Upload

The client made request to the key manager for the public key, which will be generated according to the policy associated with the file. Different policies for files, public key also differs. But for same public key for same policy will be generated. Then the client generates a private key by combining the username, password and security credentials. Then the file is encrypted with the public key and private key and forwarded to the cloud.

File Download

The client can download the file after completion of the authentication process. As the public key maintained by the key manager, the client request the key manager for public key. The authenticated client can get the public key. Then the client can decrypt the file with the public key and the private key. The user's credentials were stored in the client itself. During download the file the cloud will authenticate the user whether the user is valid to download the file. But the cloud doesn't have any attributes or the details of the user.

C. Policy Revocation for File Assured Deletion

The policy of a file may be revoked under the request by the client, when expiring the time period of the contract or completely move the files from one cloud to another cloud environment. When any of the above criteria exists the policy will be revoked and the key manager will completely removes the public key of the associated file. So no one recover the control key of a revoked file in future. For this reason we can say the file is assuredly deleted. Automatic file revocation scheme is also introduced to revoke the file from the cloud when the file reaches the expiry and the client didn't renew the files duration.

D. File Access Control

Ability to limit and control the access to host systems and applications via communication links. To achieve, access must be identified or authenticated. After achieved the authentication process the users must associate with correct policies with the files. To recover the file, the client must request the key manager to generate the public key. For that the client must be authenticated. The attribute based encryption standard is used for file access which is authenticated via an attribute associated with the file. With file access control the file downloaded from the cloud will be in the format of read only or write supported. Each user has associated with policies for each file. So the right user will access the right file. For making file access the attribute based encryption scheme is utilized.

E. Policy Renewal

Policy renewal is a tedious process to handle the renewal of the policy of a file stored on the cloud. Here we implement one additional key called as renew key, which is used to renew the policy of the file stored on the cloud. The renew key is stored in the client itself.

III. STUDY ABOUT THE SYSTEM

A. Existing System

- Existing work on access control in cloud are centralized in nature. Except and, all other schemes use ABE. The scheme in uses a symmetric key approach and does not support

authentication. The schemes do not support authentication as well.

- It provides privacy preserving authenticated access control in cloud. However, the authors take a centralized approach where a single key distribution centre (KDC) distributes secret keys and attributes to all users.

Disadvantages of Existing System

- The scheme in uses asymmetric key approach and does not support authentication.
- Difficult to maintain because of the large number of users that are supported in a cloud environment.

B. Proposed System

- We propose a new decentralized access control scheme for secure data storage in clouds that supports anonymous authentication.
- In the proposed scheme, the cloud verifies the authenticity of the series without knowing the user's identity before storing data.
- Our scheme also has the added feature of access control in which only valid users are able to decrypt the stored information.
- The scheme prevents replay attacks and supports creation, modification, and reading data stored in the cloud.

Advantages of Proposed System

- Distributed access control of data stored in cloud so that only authorized users with valid attributes can access them.
- Authentication of users who store and modify their data on the cloud.
- The identity of the user is protected from the cloud during authentication.

IV. SYSTEM DESIGN

A. System Architecture

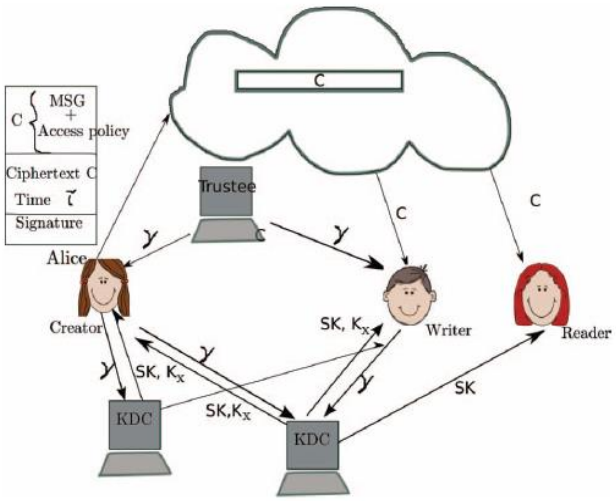

Fig. 4.1 System Architecture

B. Data Flow Diagram

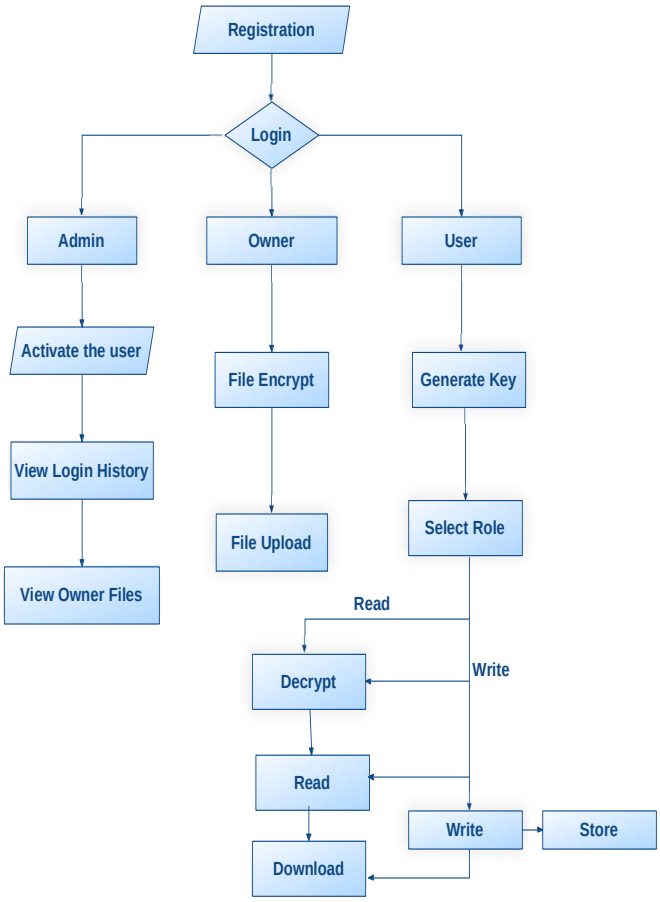

Fig. 4.2 Data Flow Diagram

C. Class Diagram

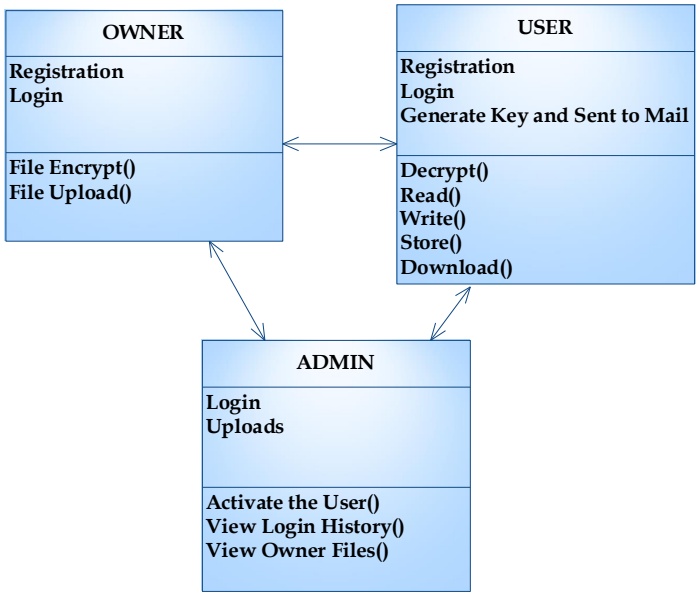

Fig. 4.3 Class Diagram

V. SAMPLE SCREEN

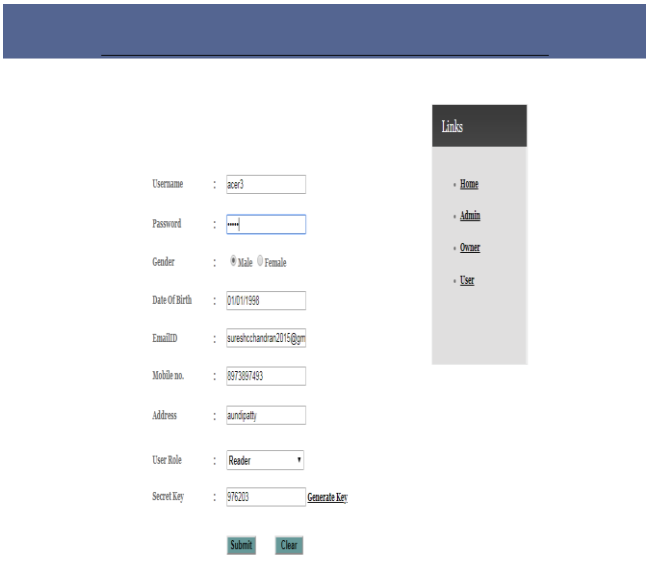

Fig. 5.1 User Registration Page

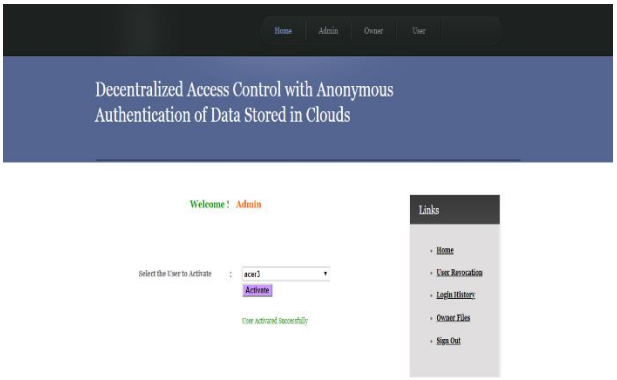

Fig. 5.2 User Activation Page

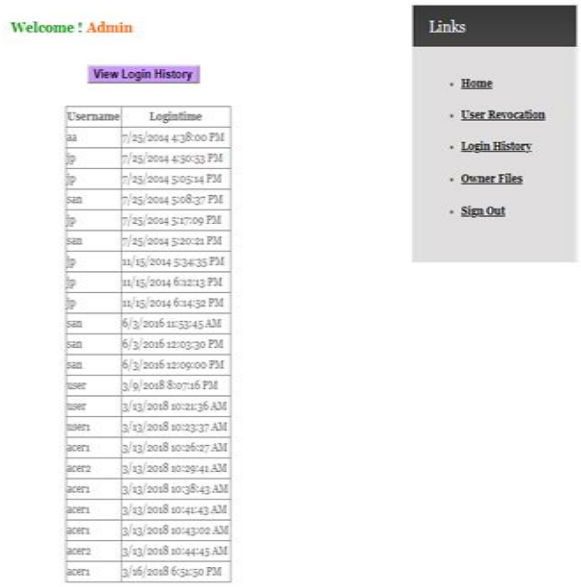

Fig. 5.3 History of Logged in Users

Fig. 5.4 List of Owners for files

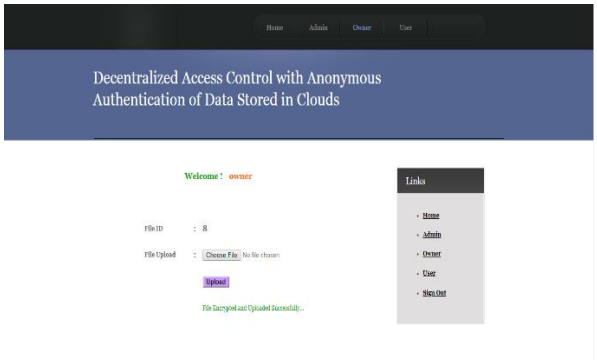

Fig. 5.5 File Upload

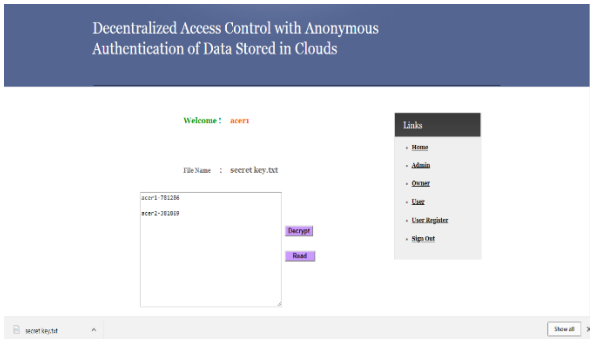

Fig. 5.6 Encrypting and Downloading a File

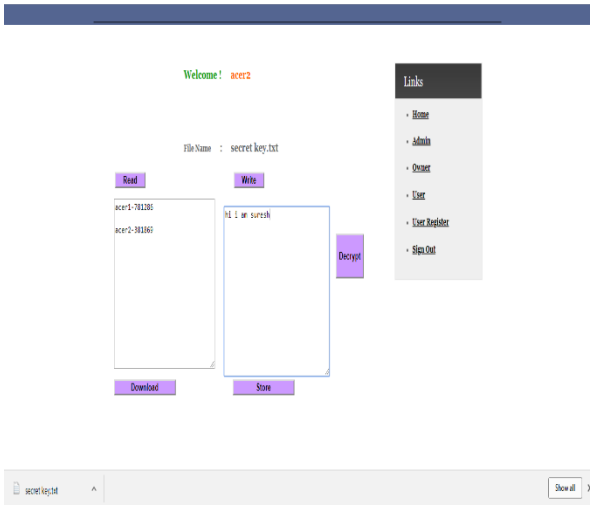

Fig. 5.7 Writing and Downloading a File

VI. CONCLUSION

We have presented a decentralized access control technique with anonymous authentication, which provides user revocation and prevents replay attacks. The cloud does not know the identity of the user who stores information, but only verifies the user's credentials. Key distribution is done in a decentralized way. One limitation is that the cloud knows the access policy for each record stored in the cloud. In future, we would like to hide the attributes and access policy of a user.

VII. FUTURE ENHANCEMENT

Decentralized access control technique with anonymous authentication, which provides user revocation and prevents replay attacks. The cloud does not know the identity of the user who stores information, but only verifies the user's credentials. Key distribution is done in a decentralized way. One limitation is that the cloud knows the access policy for each record stored in the cloud. In future, we would like to hide the attributes and access policy of a user. In future the file access policy can be implemented with Multi Authority based Attribute based Encryption. Using the technique it can avoid the number of wrong hits during authentication. Create a random delay for authentication, so the hacker can confuse to identify the algorithm.

VIII. REFERENCES

Journal Papers:

1. S. Ruj, M. Stojmenovic, and A. Nayak, "Privacy Preserving Access Control with Authentication for Securing Data in Clouds," Proc. IEEE/ACM Int'l Symp. Cluster, Cloud and Grid Computing, pp. 556-563, 2012.
2. C. Wang, Q. Wang, K. Ren, N. Cao, and W. Lou, "Toward Secure and Dependable Storage Services in Cloud Computing," IEEE Trans. Services Computing, vol. 5, no. 2, pp. 220-232, Apr.-June 2012.
3. J. Li, Q. Wang, C. Wang, N. Cao, K. Ren, and W. Lou, "Fuzzy Keyword Search Over Encrypted Data

in Cloud Computing," Proc. IEEE INFOCOM, pp. 441-445, 2010.
4. D.R. Kuhn, E.J. Coyne, and T.R. Weil, "Adding Attributes to Role- Based Access Control," IEEE Computer, vol. 43, no. 6, pp. 79-81, June 2010.
5. H.K. Maji, M. Prabhakaran, and M. Rosulek, "Attribute-Based Signatures: Achieving Attribute-Privacy and Collusion-Resistance," IACR Cryptology ePrint Archive, 2008.
6. H.K. Maji, M. Prabhakaran, and M. Rosulek, "Attribute-Based Signatures," Topics in Cryptology - CT-RSA, vol. 6558, pp. 376-392, 2011.
7. K. Yang, X. Jia, and K. Ren, "DAC-MACS: Effective Data Access Control for Multi-Authority Cloud Storage Systems," IACR Cryptology ePrint Archive, p. 419, 2012.
8. A.B. Lewko and B. Waters, "Decentralizing Attribute-Based Encryption," Proc. Ann. Int'l Conf. Advances in Cryptology (EUROCRYPT), pp. 568-588, 2011.
9. J. Hur and D. Kun Noh, "Attribute-Based Access Control with Efficient Revocation in Data Outsourcing Systems," IEEE Trans. Parallel and Distributed Systems, vol. 22, no. 7, pp. 1214-1221, July 2011.

Proceedings Papers:

1. S. Kamara and K. Lauter, "Cryptographic Cloud Storage," Proc. 14th Int'l Conf. Financial Cryptography and Data Security, pp. 136- 149, 2010.
2. H. Li, Y. Dai, L. Tian, and H. Yang, "Identity-Based Authentication for Cloud Computing," Proc. First Int'l Conf. Cloud Computing (CloudCom), pp. 157-166, 2009.
3. A.-R. Sadeghi, T. Schneider, and M. Winandy, "Token-Based Cloud Computing," Proc. Third Int'l Conf. Trust and Trustworthy Computing (TRUST), pp. 417-429, 2010.
4. R. Lu, X. Lin, X. Liang, and X. Shen, "Secure Provenance: The Essential of Bread and Butter of Data Forensics in Cloud Computing," Proc. Fifth ACM Symp. Information, Computer and Comm. Security (ASIACCS), pp. 282-292, 2010.
5. D.F. Ferraiolo and D.R. Kuhn, "Role-Based Access Controls," Proc. 15th Nat'l Computer Security Conf., 1992.
6. M. Li, S. Yu, K. Ren, and W. Lou, "Securing Personal Health Records in Cloud Computing: Patient-Centric and Fine-Grained Data Access Control in Multi-Owner Settings," Proc. Sixth Int'l ICST Conf. Security and Privacy in Comm. Networks (SecureComm), pp. 89-106, 2010.
7. S. Yu, C. Wang, K. Ren, and W. Lou, "Attribute Based Data Sharing with Attribute Revocation," Proc. ACM Symp. Information, Computer and Comm. Security (ASIACCS), pp. 261-270, 2010.
8. G. Wang, Q. Liu, and J. Wu, "Hierarchical Attribute-Based Encryption for Fine-Grained Access Control in Cloud Storage Services," Proc. 17th ACM Conf. Computer and Comm. Security (CCS), pp. 735-737, 2010.
9. F. Zhao, T. Nishide, and K. Sakurai, "Realizing Fine-Grained and Flexible Access Control to Outsourced Data with Attribute-Based Cryptosystems," Proc. Seventh Int'l Conf. Information Security Practice and Experience (ISPEC), pp. 83-97, 2011.
10. S. Ruj, A. Nayak, and I. Stojmenovic, "DACC: Distributed Access Control in Clouds," Proc. IEEE 10th Int'l Conf. Trust, Security and Privacy in Computing and Communications (TrustCom), 2011.
11. S. Jahid, P. Mittal, and N. Borisov, "EASiER: Encryption-Based Access Control in Social Networks with Efficient Revocation," Proc. ACM Symp. Information, Computer and Comm. Security (ASIACCS), 2011.
12. R.L. Rivest, A. Shamir, and Y. Tauman, "How to Leak a Secret," Proc. Seventh Int'l Conf. Theory and Application of Cryptology and Information Security (ASIACRYPT), pp. 552-565, 2001.
13. X. Boyen, "Mesh Signatures," Proc. 26th Ann. Int'l Conf. Advances in Cryptology (EUROCRYPT), pp. 210-227, 2007.

14. D. Chaum and E.V. Heyst, "Group Signatures," Proc. Ann. Int'l Conf. Advances in Cryptology (EUROCRYPT), pp. 257-265, 1991.
15. A. Sahai and B. Waters, "Fuzzy Identity-Based Encryption," Proc. Ann. Int'l Conf. Advances in Cryptology (EUROCRYPT), pp. 457-473, 2005.
16. V. Goyal, O. Pandey, A. Sahai, and B. Waters, "Attribute-Based Encryption for Fine-Grained Access Control of Encrypted Data," Proc. ACM Conf. Computer and Comm. Security, pp. 89-98, 2006.
17. J. Bethencourt, A. Sahai, and B. Waters, "Ciphertext-Policy Attribute-Based Encryption," Proc. IEEE Symp. Security and Privacy, pp. 321-334, 2007.
18. X. Liang, Z. Cao, H. Lin, and D. Xing, "Provably Secure and Efficient Bounded Ciphertext Policy Attribute Based Encryption," Proc. ACM Symp. Information, Computer and Comm. Security (ASIACCS), pp 343-352, 2009.
19. M. Chase, "Multi-Authority Attribute Based Encryption," Proc. Fourth Conf. Theory of Cryptography (TCC), pp. 515-534, 2007.
20. H. Lin, Z. Cao, X. Liang, and J. Shao, "Secure Threshold Multi-Authority Attribute Based Encryption without a Central Authority," Proc. Progress in Cryptology Conf. (INDOCRYPT), pp. 426-436, 2008.
21. M. Chase and S.S.M. Chow, "Improving Privacy and Security in Multi-Authority Attribute-Based Encryption," Proc. ACM Conf. Computer and Comm. Security, pp. 121-130, 2009.
22. M. Green, S. Hohenberger, and B. Waters, "Outsourcing the Decryption of ABE Ciphertexts," Proc. USENIX Security Symp., 2011.
23. W. Wang, Z. Li, R. Owens, and B. Bhargava, "Secure and Efficient Access to Outsourced Data," Proc. ACM Cloud Computing Security Workshop (CCSW), 2009.

Thesis:

1. C. Gentry, "A Fully Homomorphic Encryption Scheme," PhD dissertation, Stanford Univ., http://www.crypto.stanford.edu/ craig, 2009.
2. R.K.L. Ko, P. Jagadpramana, M. Mowbray, S. Pearson, M. Kirchberg, Q. Liang, and B.S. Lee, "Trustcloud: A Framework for Accountability and Trust in Cloud Computing," HP Technical Report HPL-2011-38, http://www.hpl.hp.com/techreports/2011/HPL-2011-38.html, 2013.
3. A. Beimel, "Secure Schemes for Secret Sharing and Key Distribution," PhD thesis, Technion, Haifa, 1996.

Web References:

1. http://docs.oasis-open.org/xacml/3.0/xacml-3.0-core-spec-cs-01-en.pdf, 2013.
2. http://securesoftwaredev.com/2012/08/20/xacml-in-the-cloud, 2013.
3. http://crypto.stanford.edu/pbc/, 2013.
4. "Libfenc: The Functional Encryption Library,"http://code. google.com/p/libfenc/, 2013.

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Natural Resource Utilization and Problems in Haryana

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ABSTRACT

There is a need for strengthening the Department of Agro-meteorology for mainstreaming the climate change related mitigation and adaptation measures into natural resource management research and development to begin with climate smart and weather forecast based agriculture in the State. Increased use of fossil fuel, puddled rice cultivation and large bovine cattle population in the country are major sources of emission of GHG and global warming. The research results suggest that the C3 crops will be benefited from CO2 enrichment, but the elevated temperature will increase water use, reduce maturity duration and productivity due to global warming.

Keywords : Natural Resource. Resource Management, agriculture, water management, soil conservation, Haryana, HAU Hisar

I. INTRODUCTION

Carved out as a separate State from the erstwhile State of Punjab on November1, 1966, Haryana has total geographical area of 4.42 million ha that accounts for 1.4% of the total geographical area of the country and less than 2.6% of country's population (Yadav and Kumar, 2010). Agriculture being the primary livelihood base, nearly 85% of the area is under cultivation, 3.52% is under forestry while remaining area accounts for non-agricultural uses.

The Haryana State, located between 27°30' and 30°35' N latitude and 74°28' and 77°36' E longitude is a part of the north western arid and semiarid plains with an average rainfall of 545mm that ranges from 1200mm in the extreme north-east to less than 300mm in the arid west. The State is bounded by Siwalik hills in the north, river Yamuna in the east and Aravali hills in the south. More than 98% of the area of the State is covered by alluvial plains including the western deserted terrain of sand dunes. River Yamuna and Ghaggar flood plains constitute a large part of the State and the entire area is covered by three basins (Fig.1): namely, Yamuna basin (16330 sq. km.), Ghaggar basin (10675 sq. km.) and Inland basin (17207 sq. km.). The altitude in the State varies from 190m to 1200m above msl whose consequential physiography is depicted in Fig.2. Topographically a large part of Haryana plains constitute a widely spaced topographic depression between Siwalik hills and Aravali hills which has created typical internal drainage condition in the central and western parts including the districts of Rohtak, Jhajjar, Bhiwani, Hisar, Sirsa and parts of Sonipat (Fig 1). Haryana has a unique geographical feature whose water travels both into Indus and Ganges basins.

Forested areas in Haryana State are declining due to harsh conditions, overgrazing, the expansion of farmland and rapid urbanization. The objective of the Integrated Natural Resource Management and Poverty Reduction Project (INRMPRP) in Haryana is to regenerate the forest through forest resource

management activities such as afforestation, watershed protection and soil conservation. This will result in long-term development of nature and society in the region as the standard of living improves for the people who live in and around the forest. Through the INRMPRP in Haryana, community participation afforestation activities are being carried out on land totaling approximately 50 thousand hectares. Additionally, the project aims to reduce poverty by carrying out small-scale infrastructure improvements in villages and provide job training to help residents dependent on the forests for their livelihoods find alternative sources of income. Furthermore, in order to dynamically develop the organizational skills of the Forest Department and the community, various teaching and awareness activities and training are being carried out. In this way, efforts are being made not only for facilitating afforestation activities, but also activities that aim to ensure sustainability for the regenerated forests. As a sub-component of the INRMPRP in Haryana, the Children's Forest Program is being implemented in coordination with a Japanese non-governmental organization, the Organization for Industrial, Spiritual and Cultural Advancement (OISCA).

The State has made great strides in food production and contributes significantly to the national food basket. The Green Revolution has helped to bring around 85% of the total geographical area under cultivation with a cropping intensity of about 181%. However, recent agricultural trends in agriculture production are not very encouraging. The indiscriminate use of natural resources in intensively cultivated areas of Haryana has started showing negative impacts on soil health, progressive decline in input use efficiency and total factor productivity and increase in cost of cultivation, pollution of water and environment and threat of climate change on agriculture, and thus a real challenge to sustain 4% or higher growth of agriculture sector in the State. Inevitably, the food security situation is likely to become critical in the changing scenario if urgent actions to prepare the farmers to adopt appropriate soil, water and crop management practices to face the futuristic problems of resource constraints are not taken.

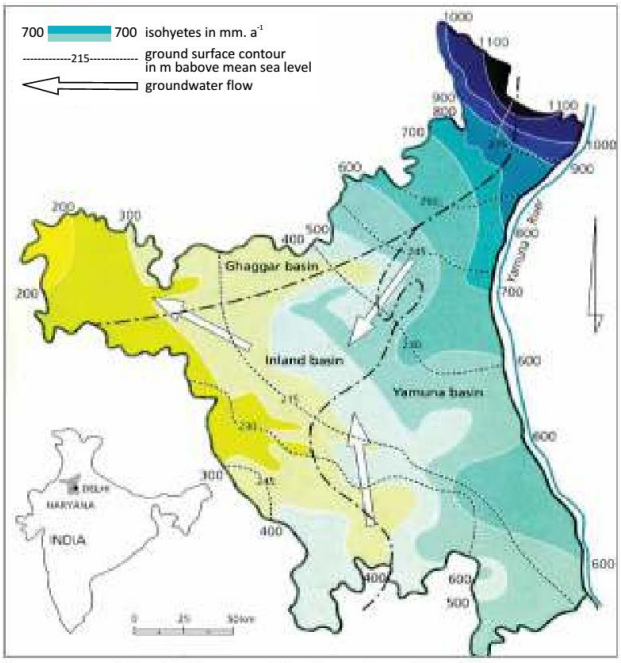


Fig.1: Geographic domain of Haryana

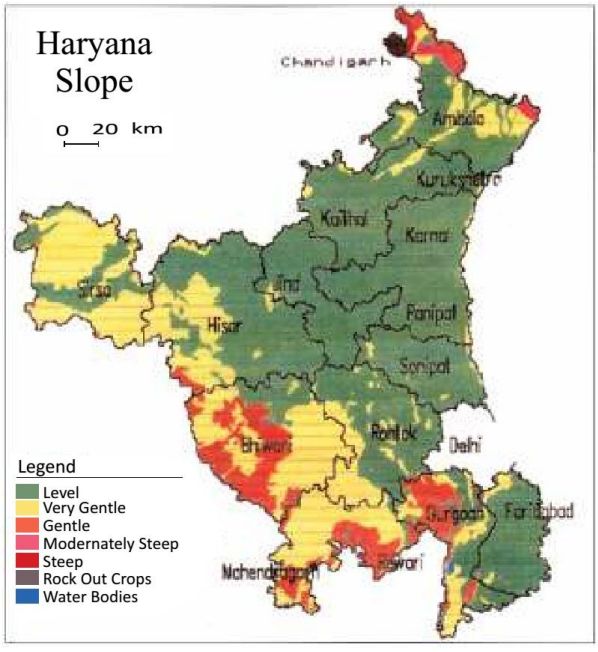
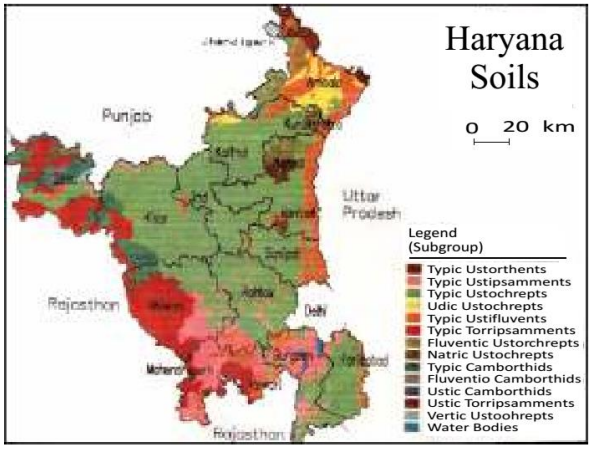


Fig.2: Haryana physiography

1.2 NATURAL RESOURCES

1.2.1 Soil Resources

Soil resources of the State are developed on alluvium in the plains and on detrital and alluvial materials in northern sub-mountains tracks, an aeolian material in the extreme western fringe and on alluvium modified by aeolian activity in southern and south western part of the State. Taxonomically, Inceptisols are dominant soils occupying about 58% of the area followed by Entisols (28%), Aridisols (9%) and Alfisols (2%) (Fig.3). Texturally, fine loamy soils are dominant and cover 43% of the area, coarse loamy soils cover 34% and sandy soils 23% of the total area.



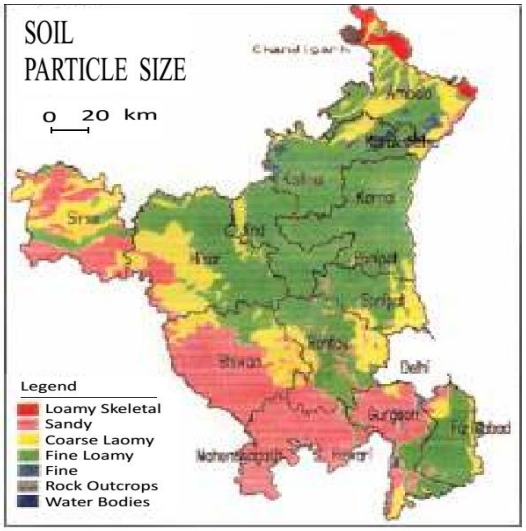


Fig.3: Soil resources of Haryana (Textural classification)

1.2.2 Water Resources

The total potential of surface and ground water resource is estimated at 1.51 and 1.24 m ha m respectively, amounting to 2.75 m ha m including ground water of marginal quality (Figs. 5, 6). The north eastern part of the State is extensively underlain by fresh ground water, the remaining 28,000 km² (about 60%) is underlain by brackish to very saline groundwater. Considering urban and industrial needs of water resources, existing available water resources can meet hardly 60% of the irrigation requirements. Over the past 4 to 5 decades, all out efforts have been made to tap all available resources to meet agricultural needs. Western Yamuna Canal originating from river Yamuna, and Bhakra Canal originating from river Sutlej constitute the main surface irrigation system. The Western Yamuna Canal which takes water up to Hisar is one of the oldest canals of this region, constructed in 1351AD by Ferozshah Tuglak and remodeled later by King Shahjahan. Secondary and tertiary canal systems include Gurgaon and a number of lift irrigation projects including Jui, Indira Gandhi, B. N. Chakraborty and Jawaharlal Nehru lift irrigation schemes that raise water in stages upto 174m to bring irrigation to sandy tracks of western and southern Haryana (For other details, see Fig.7).

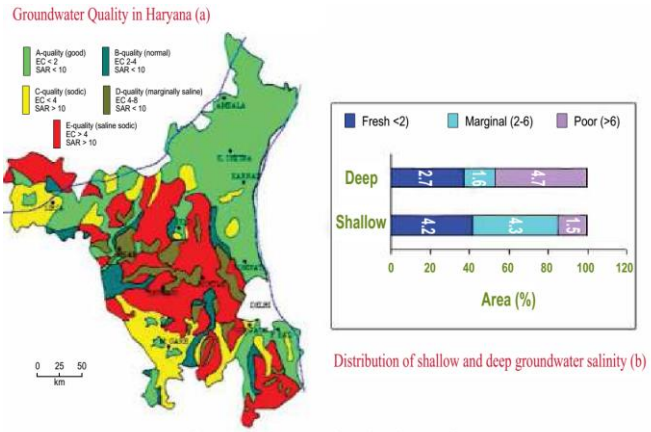
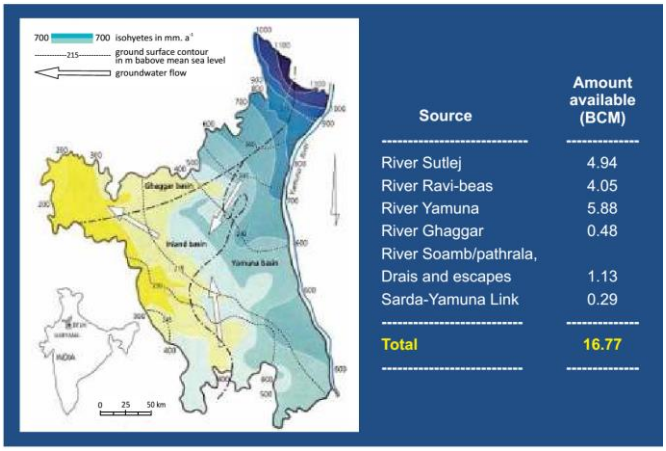
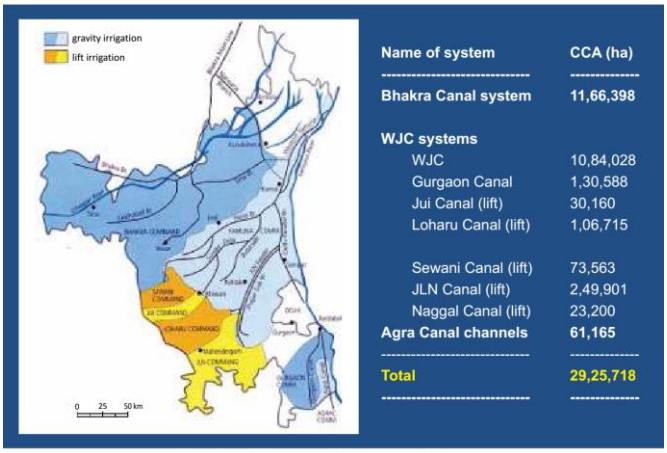


Fig.5: Ground water quality (a) and its distribution (b) in Haryana



Source	Amount available (BCM)
River Sutlej	4.94
River Ravi-beas	4.05
River Yamuna	5.88
River Ghaggar	0.48
River Soamb/pathrala, Drais and escapes	1.13
Sarda-Yamuna Link	0.29
Total	**16.77**

Fig.6: Source and amount of available surface water in Haryana



Name of system	CCA (ha)
Bhakra Canal system	**11,66,398**
WJC systems	
WJC	10,84,028
Gurgaon Canal	1,30,588
Jui Canal (lift)	30,160
Loharu Canal (lift)	1,06,715
Sewani Canal (lift)	73,563
JLN Canal (lift)	2,49,901
Naggal Canal (lift)	23,200
Agra Canal channels	**61,165**
Total	**29,25,718**

Fig.7: Surface (canal) water supply system and its CCA in Haryana

1.2.3 Climate and Agroecological Zones

The climate of the region being semi arid and arid, water resources of the State have played a critical role in the improvement and sustainability of agricultural production. Mean annual rainfall of 545mm, is received unevenly in the State (Fig. 8) and the annual evaporation demand exceeds 1500 mm. The GCM models predicted that the Indian Sub-continental will be warmer by about 1.5°C during the middle of current century, and the second half of the winter will be warmer than the first half. It is also predicted that the Indian sub-continent would receive about 6% more rains which could be irregular and more intense. There will be some reduction in the incident radiation and increase in the concentration of CO2 and other green house gases during the current century. Thus, there is a need to undertake appropriate adaptation and mitigation measures to address the impact of climate change on agriculture.

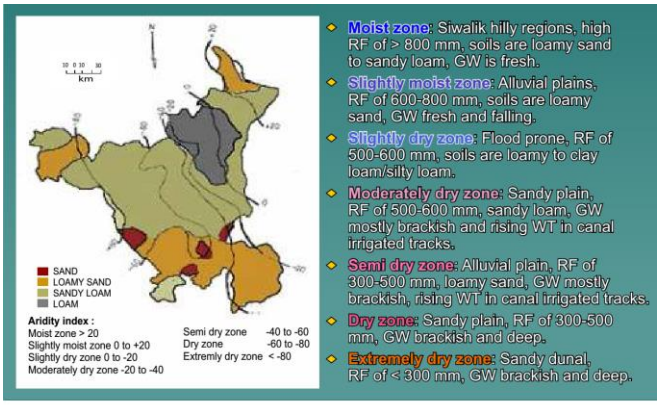


Fig.8: Agro-ecological zones of Haryana

1.2.4 Crops, Cropping Systems and Biodiversity

Agro-climatic resource conditions, development of water resources and the State policies have contributed to the prevalent crops and farming systems in different parts of the State. The main aim of research and development was to maximize the productivity of crops with relatively little attention to sustainability of resource use and management. The crop cultivars currently grown are mostly modern short statured high yielding and have replaced many of the traditional cultivars adopted earlier by the farmers. With practically little attention devoted to understanding and addressing issue of biodiversity and its dynamics, it has started reflecting in emergence of new disease and pest scenario seriously threatening production base. As an example, introduction of high yielding varieties of rice and wheat crops and improvement in irrigation facilities and use of chemical fertilizers, the indigenous sorghum, maize and millets growing area has been shifted to mainly rice-wheat system. The traditional indigenous crops, their varieties/ races/ biotypes occurring naturally, which were not high yielding otherwise, had many desirable characters like resistance to various biotic and abiotic stresses and better quality.

1.2.5 Agricultural Development and State of Natural Resources

Over the past four decades, the State has made rapid strides to achieve goals of enhanced agricultural productivity and contributed significantly to achieve food grains production goals towards meeting the growing demand for increasing population, export etc. Expansion of area under irrigation involving a network of canals, minors, lift canals, support for sinking tubewells, credit and marketing constituted the core of the strategy to achieve production goals together with availability and adoption of improved high yielding crop cultivars, increased use of fertilizers and plant protection chemicals (Table1). These efforts driven by the Central Government and supported and implemented by the State Government in the form of number of 'schemes' have yielded dividends by way of Haryana emerging as a front runner State in agriculture.

Table1: Agriculture Development in Haryana

Area (000 ha)	1966-67	2010-11
Geographic Area	4421	4421
Cultivable area (% of total geographic area)	86.45	86.27
Net sown area	3423	3576
Total cropped area	4599	6484
Cropping intensity (%)	134.4	181.3
Net irrigated area		
(i) Canals	991	1277
(ii) Minor irrigation	302	1602
Total	1293	2879
Gross irrigated area	1736	5528
% Net irrigated area	37.8	84.16
% Gross irrigated area	37.7	86.00

Source: website of Agriculture Department, Haryana

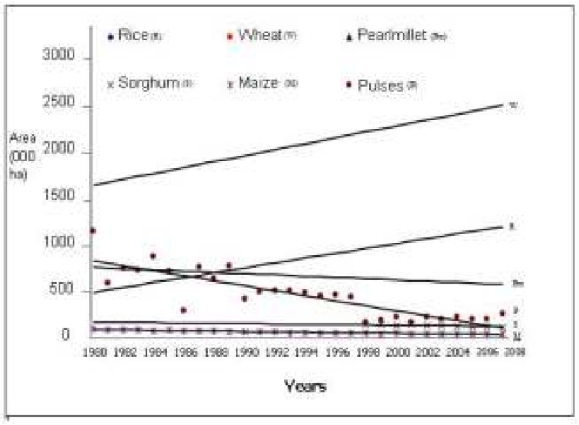


Fig.9: Trends in acreage under food grain crops from 1981 to 2008

1.3 POLICY ISSUES

In order to find solution of location specific complex and interlinked problems of Natural Resource Management (Land, soil, water, biodiversity, climate) for sustainability of agriculture in the State, the Working Group observed that there is an urgent need to undertake the following activities/actions:-

- Seting up a school of Natural Resource Management and Environmental Sciences at CCS HAU, Hisar to prioritize, undertake and guide education, research and development for sustainable resource management in the State.
- The school should have multidisciplinary team of scientists drawn from the bio-physical, social and environmental sciences with expertise in areas of remote sensing-GIS applications and modeling of different components of natural resource system inclusive of soil resource, irrigation and drainage systems, watershed management, cropping and farming system, agroecology and climatic resources as well as resource use optimization.
- Encouraging use of organic manure, bio-fertilizer, green manure/ legumes in crop sequences, commissioning of bio-gas plants/ plantation of multipurpose trees to save cow dung from burning, promoting CA based technologies for recycling of crop residues and organic farming to improve organic carbon content in soils.
- Undertaking time bound programme to bring at least 50% area in next 10 years under pressurized system of irrigation and other water saving devices.
- Policy initiatives to shift the irrigation charges from irrigated area to volumetric basis to speed up the adoption of pressurized system of irrigation and other water saving devices to cover more area under irrigation by farmers in the canal commands.

- Enforcement of laws banning diversion of untreated sewage water and industrial effluent in fresh water streams.
- Need of policy initiatives for increased allocation of canal water or adequate diversion of excess rainwater to water deficit arid regions but it should precede after scientific studies on salt and water balance, energy cost and socio-economic benefits on long run to the stakeholders.
- Promotion of managed forestry and agro-forestry by treating tree as crop for planting and harvesting purposes and incentive to farmers for undertaking agro-forestry, pisciculture and biodrainage under problematic soils and water conditions.
- Need for effective steps to focus on the large amount of biodiversity, both underground and above ground, for proper preservation and utilization in the State.
- Developing viable units for on-hand training in farming systems perspective with emphasis on intensification, diversification, resource conservation and value addition at the HQ of CCSHAU to train students, farmers and other stakeholders to develop entrepreneurship skills for employment/self employment, profitability and livelihood security of small farm holders.
- Need for establishing better coordination and accountability among different institutions, relevant State Government Departments, Central and other developmental agencies and stakeholders to find solutions of complex and interlinked problems of natural resource management to sustain growth of agriculture in the State.

1.4 STATE OF NATURAL RESOURCES

- Developing digital data base on status and dynamics of land use, soil, water, climate, vegetative cover and cropping and farming systems by HARSAC and SAU.
- Undertaking regular mapping and characterization of natural resources in digital form (Land, soil, water, climate, vegetative cover) and natural calamities (Drought, flood etc) using modern tools of remote sensing/GIS by HARSAC.
- Undertaking specific land use-cover change studies in relation to resource status/ degradation or other socioeconomic and development issues with a view to understand the nature of the driving forces and option to address the problems.
- Some of the issues which relate critically to sustained agricultural development include; declining farm size and area under prime agricultural lands, contamination of agricultural lands and groundwater systems by industrial and sewage waters, stagnating area under forestry cover and degradation of fragile erosion prone Aravallis and Shivalics.
- Bringing out 'The State of Natural Resources' report in digital form, every five years. The first report should be planned within the next two years. The initiative for this must come from CCSHAU and HARSAC.

1.5 STRATEGIC, APPLIED AND ADAPTIVE RESEARCH

- Need for greatly strengthened Regional Research Stations of CCS HAU to prioritize location specific research and development agenda in general and striving for better scientist-farmer connect- adaptive research projects in farmers participatory mode in particular to address regional specific issues of NRM in the State.
- Mainstreaming climate change related mitigation and adaptation measures through

multidisciplinary strategic and adaptive research for development.

- Developing solutions to hydrological imbalances through integrated approaches involving on-farm water management, conjunctive use of water, pressurized system of irrigation and other water saving devices, surface and subsurface drainage, recharge of aquifers, diversification, intensification, CA based technologies and holistic watershed management approach.
- Amelioration of poor quality groundwater in inland basin through cyclic process of groundwater extraction and recharge with good quality water on pilot scale in farmer participatory mode.
- Developing full scientific package for use of waste water in peri-urban areas of the State, particularly for cultivation of vegetables and fodder crops.
- Undertaking holistic evaluation of selected executed projects in the areas of agricultural drainage, irrigation and watershed management and agroforestry with a view to assess their effectiveness in achieving the targeted objectives
- Making concerted efforts to substitute puddled rice with alternate crops such as hybrid maize/soybean based cropping systems and adoption of CA based technologies.
- Location specific concerted efforts for fine tuning of different resource conservation technologies (DSR, diversification, intensification, raised bed planting, residue incorporation, brown manuring etc) under different production systems.
- Developing alternate technologies for crop residue management in ricewheat and cotton-wheat cropping system and use of biochar from crop residue to enhance C-sequestration.
- Mainstreaming farming system research aimed at better understanding of farming system perspectives involving farmers, available resources and economic conditions and the way they interact with natural resources.
- Linking multi-enterprize models of integrated farming system with market, value addition, processing, handling and storage facilities of agriculture produce at production sites for livelihood security of small land holders.

1.6 DEVELOPMENTAL ISSUES:

- The clear focus of development efforts should be to help the farmers to manage their own resources in sustainable manner. • Development of scientific land use planning of the State using modern tools of remote sensing/GIS by HARSAC and CCSHAU, Hisar.
- Promoting integrated agricultural practices and strategies which improve organic carbon content of soils.
- Undertaking special drive for inclusion of legume or green manure crops in cereal-cereal cropping system either as catch or inter/mixed crops.
- Modifying existing soil health cards into system of “Soil Nutrient Management” by Department of Agriculture with greater emphasis to maintain soil organic matter and good soil health.
- Discouraging flood irrigation and encouraging pressurized system of irrigation and other water saving devices (Furrow irrigation, raised and sunken beds, fertigation, protected cultivation, plasticulture etc) through proper incentives to farmers.
- Augmentation of water supplies by conserving rainwater in the fields, aquifers, water bodies, conjunctive use of brackish and fresh waters, treatment of sewage and industrial effluent for use in irrigation and desilting of existing water bodies and construction of new water storage structures to cope up with scarcity of irrigation water.

- Strengthening the capacity of the CCS Haryana Agricultural University, State Department of Agriculture and Irrigation Department to undertake training programmes to focus on improved on-farm water management using modern tools to extension workers, farmers and other stakeholders.
- Exploring all avenues to strengthen human resources base, both in terms of number and quality, through partnership with overseas institutes of repute in the field of Natural Resource Management in CCS Haryana Agricultural University, Hisar.

II. REFERENCES

[1]. Abrol, I. P., Gupta, R. and Malik, R. K. 2005. (Eds.). Conservation Agriculture-Status and prospects, CASA, New Delhi, 154p.

[2]. Antil, R. S. 2012. Integrated Nutrient Management for Sustainable Soil Health and Crop Productivity. Presentation in Productivity Enhancement Workshop conducted by Haryana Kisan Ayog, CCSHAU Campus, Hisar (Haryana).

[3]. Agarwal, M.C., Roest, C.W.J. 1996. Towards improved Water Management in Haryana State; Final Report of the Indo-Dutch Operational Research Project On Hydrological Studies. CCS Haryana Agricultural University, Hisar, International Institute for Land Reclamation and Improvement, Wageningen, DLO Winand Staring Centre for Integrated Land, Soil and Water Research, now Alterra Green World Research, Wageningen. P 80.

[4]. Anonymous , 1998. Management of water logging and salinity problems in Haryana. Master Plan. Govt. of Haryana.

[5]. Anonymous , 1991. Waterlogging, Salinity and Alkanity. Government of India, Ministry of Water Resources, New Delhi.

[6]. Bhattacharya, A. K. and Michael, A. M. 2003. Land Drainage: Principles, Methods and Applications. Konark Publishers Pvt Ltd, A-149, Main Vikash Marg, Delhi 110092.

[7]. Central Soil Salinity Research Institute, Karnal Annual Reports, 2005-06 to 2010-12.

[8]. Deora, A. 2012. Utilization of the strength and capacity of microbes in reclamation of problematic waters for irrigation. Abstract in International Seminar on Renewable Energy for Institutes and Communities in Urban and Rural Setting. Organized by Manav Institute of Technology, Hisar from April 27- 29, 2012.pp 15-16.

[9]. Dhindwal, A. S. and Jhorar, R. K. 2012. Water Resource Management in Haryana. Presentation in Productivity Enhancement Workshop conducted by Haryana Kisan Ayog, CCSHAU Campus, Hisar (Haryana).

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Preparation of Quality Data for Air Pollution Forecasting

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ABSTRACT

This paper proposes a preparation of quality data for training accurate machine learning model. Data preparation is very important in machine learning. Here we are preparing the data for air pollution forecast. As Air pollution forecasting has traditionally been done by physical models of the atmosphere, which are unstable and in accurate for large periods of time. Since machine learning techniques are more robust to perturbations, in this paper we explore the data preparation and applications of machine learning to air pollution forecasting to potentially generate more accurate predictions. A Linear Regression model is used to train the data a more accurately and predict the air pollution.

Keywords : Machine Learning, Data Preparation, Data- Collection, Air Pollution Data, Linear Regression Model.

I. INTRODUCTION

Air pollution forecasting is the task of predicting the pollutants of atmosphere like ozone (O3), particle matter (PM), sulphur dioxide (SO2), carbon monoxide (CO), nitrogen dioxides (NO2), volatile organic compounds (VOCs) [1]. SO2, NO2 as an important precursor of new particle formation and particle growth, has also been found to be associated with respiratory diseases in many countries. Therefore, we selected NO2 and SO2 for testing in this study.

Machine learning is category of algorithm that allows software applications to become more accurate in predicting outcomes without being explicitly pro-grammed. There are various important steps in machine learning. They are Data collection and Data preparation. Data collection is the systematic approach to gathering and measuring information from a variety of sources to get a complete and accurate results. Data preparation is the process of transforming raw data so that data scientists and analysts can run it through machine learning algorithms to uncover insights or make predictions.

A Machine learning algorithm is used for this problem is Linear Regression Model [2]. Both for the data preparation and for the predicting air pollutants. A historical air pollution data of India was obtained and used as a training data for the algorithm. The input data has the pollution of the features and the output is the predicted error between the actual and predicted values of the pollution.

A. DATA SETS AND FEATURES

We have taken the data sets of India from 1990-2015 are downloaded from the internet. The historical data is collected for 15 years. As the data is huge we can train the data well and accurate and the information we get is more accurately predicted [3].here we have

taken the data of India for 15 years. By using this data sets the air pollutants No_2 and So_2 are predicted.

Table 1: Dataset of AP

Sl.no	Year	day	month	AP
0	1.0000	0.0000	0.7666	0.0
1	0.1071	0.0909	0.0000	0.0
2	0.9285	0.3636	0.3333	0.0
3	0.4285	0.9090	0.0000	0.0

Table 2: showing NO_2 feature

Sl.no	Year	data	month	No_2
0	0.1071	0.0909	0.0	0.1741
1	0.1071	0.0909	0.0	0.0700
2	0.1071	0.0909	0.0	0.2852
3	0.1071	0.1818	0.0	0.1471

B. DATA PREPARATION

Data preparation is the process of transforming raw data so that data scientists and analysts can run it through machine learning algorithms to uncover insights or make predictions. Data preparation is to identify and remove errors and duplicate data in order to create a reliable dataset. This improves the quality of training data for analytics and enables accurate decision making. Machine learning may be powerful, but without the relevant or right data training your system may fail to yield ideal results. Data preparation consists of two basic stages. They are Error identification and Error solving. These Error identification and Error solving are tested during the training of the data. Error identification is the testing of weights of the features (SO2 and NO2). Error identification is testing of the Loss function of the features.

Most machine learning algorithms require data to be formatted in a very specific way, so datasets generally require some amount of preparation before they can yield useful insights. Some datasets have values that are missing, invalid, or otherwise difficult for an algorithm to process [4]. If data is missing, the algorithm can't use it. If data is invalid, it causes the algorithm to produce less accurate or even misleading outcomes. Good data preparation produces clean and well-curated data that leads to more practical, accurate model outcomes.

Steps in Data preparation:

- Normalization
- Feature selection
- Model selection
- Data splitting
- Validation

II. NORMALIZATION

Normalization is a technique often applied as part of data preparation for machine learning. The goal of normalization is to change the values of numeric columns in the dataset to a common scale, without distorting differences in the ranges of values. For machine learning, every dataset does not require normalization. It is required only when features have different ranges. Data normalising is the process of rescaling one or more attributes to the range of 0 to1.The largest value of the each attribute is 1 and the smallest value of each attribute is 0. It is used to eliminate the redundant or useless data and to reduce complexity of data.

EXAMPLE: SO2, let SO2 be fs

normalization(N) = f1 max –f2min

F=f1+f2+f3 ……..f;

Nf1=f1-mean (fs)/N

III. FEATURE SELECTION

Feature Selection is one of the core concepts in machine learning which hugely impacts the performance of your model. The data features that

you use to train your machine learning models have a huge influence on the performance. Irrelevant or partially relevant features can negatively impact model performance. Feature selection and Data cleaning should be the first and most important step of your model designing. Feature Selection is the process where you automatically or manually select those features which contribute most to your prediction variable or output in which you are interested in. Having irrelevant features in your data can decrease the accuracy of the models and make your model learn based on irrelevant features. The data features that we use to train machine learning models have a huge influence on the performance you can achieve. Removing columns that have large NA (not available) rows of the data sets and finding the variance for all the columns and are sorted according to the largest variance and smallest variance. Largest variance features are taken to train the data.

Given is the formula for variance, $\sigma^2 = \sum_{i=1}^{n} \frac{(x_i - \overline{x_n})^2}{N}$

Benefits of performing feature selection are as follows:

Reduces overfitting: less redundant data means less opportunity to make decisions based on noise.

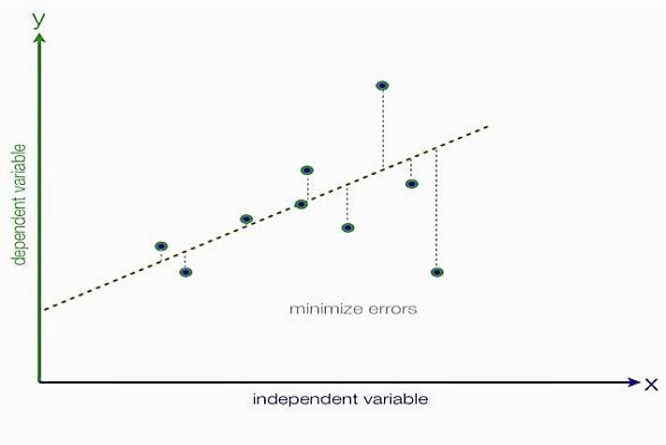
Improves accuracy: less misleading data means model accuracy improves.

Reduces training time: fewer data points reduce algorithm complexity and algorithm train faster.

IV. MODEL SELECTION

Linear-regression models are relatively simple model to generate predictions. Linear regression attempts to model the relationship between two variables by fitting a linear equation to observed data. One variable is considered to be an explanatory variable, and the other is considered to be a dependant variable. For example, A model might want to relate the weights of individuals to their heights using a linear regression model. Before attempting to fit a linear model to observed data, a model should first determine whether or not there is relationship between the variables of interest. This does not necessarily imply that one variable causes the other (for example, higher SAT scores do not cause higher college grades), but that there is some significant association between the two variables. A scatterplot can be helpful tool in determining the strength of the relationship between two variables. If there appears to be no association between the proposed explanatory and dependent variables (i.e., the scatter plot does not indicate any increasing or decreasing trends), then fitting a linear regression model to the data probably will not provide a useful model.

A numerical measure of association between two variables is the correlation coefficient, which is a value between -1 and 1 indicating the strength of the association of the observed data for the variables. Linear regression model is to estimate real values based on continuous variable. It can establish a relationship between independent and dependent variables by fitting a best fit line. The best fit line is known as Regression line and represented by a linear equation y = a x + b



y - dependent variable, a – slope, x - independent variable, b - intercepts

V. DATA SPLITTING

We use training data to basically train our model. Training data is a complete set of feature variables or the independent variable and target variable or the dependent variable .so that our model is able to learn the value of target variable on a particular set of feature variables. When encountered with a large set of data we use the major portion of data as a training set. After supplying training data now it is the time to test that how much our model has learned from that data just like as humans in college after we learn our subjects we are required to give the test to clear the subject. We test our model by supplying the feature variables to our model and in turn, we see the value of the target variable predicted by our model. We generally take a minor portion of the whole data as the test set which is generally 25% or 33% of the complete data set.

One portion of the data is used to develop a predictive model. and the other to evaluate the model's performance. We do random shuffling of data for training all data. Train data and test data can be split in these range (80-2, 60-40).

VI. VALIDATION

The training data is given to linear regression model. The weight of the feature is calculated and is given as

$$y = \sum_{i=1}^{N} w_i x_i \text{ ……..(1)}$$

where w_i- unknown weight, x_i - inputs, y - outputs Initializing $\hat{w}_i$ *based on* x_i *we get*

$$\hat{y} = \sum_{i=1}^{N} \hat{w}_i x_i \text{ …….. (2)}$$

The result of the train data is given to the loss function to reduce the errors in prediction. If predictions deviates too much from actual results then we use Loss function

$$L = \frac{1}{2}(y - \hat{y})^2 \text{ …….(3).}$$

The derivative of loss function is

$$w_{i+1} = w_i - \eta \frac{\partial L}{\delta w_i} \quad \text{…(4)}$$

The test data is given to the linear regression model. The model obtained from the train data is called test data. Test data is given to linear regression model. The weight of the feature is calculated as

$$y = \sum_{i=1}^{N} w_i x_i \text{ ……(5)}$$

Where w_i- unknown weight, x_i - inputs ,y - outputs By Initializing $\hat{w}_i$ *based on* x_i *we get,*

$$\hat{y} = \sum_{i=1}^{N} \hat{w}_i x_i \text{ ……..(6)}$$

The result of the test data is again given to the loss function to reduce the errors in prediction. If predictions deviates too much from actual results.

$$\text{Where } L = \frac{1}{2}(y - \hat{y})^2 \text{……..(7)}$$

The derivation of loss function is as follows

$$w_{i+1} = w_i - \eta \frac{\partial L}{\delta w_i} \text{……(8)}$$

The error solving and error identification are known by knowing the weights and loss function of the air pollutants.

VII. RESULT

The error in prediction features for the testing data using linear regression. The error in prediction is shown both for the No2 and so2. There will be no prediction without error, as we take huge data for training purpose we get error in prediction.

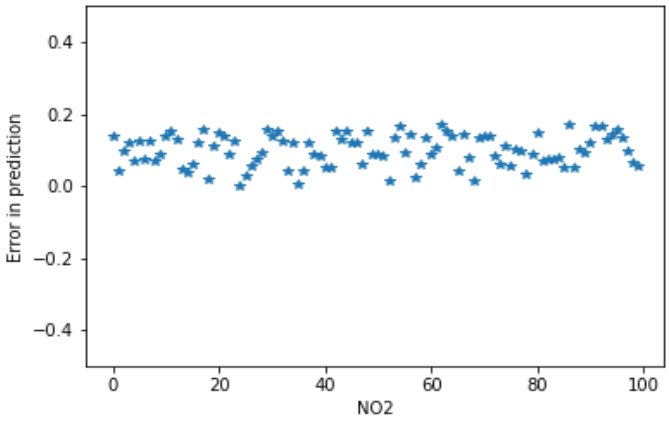


Fig1: The graph above is showing the error prediction of the No2.

To know clearly the difference between the actual value and predicted value is as shown below.

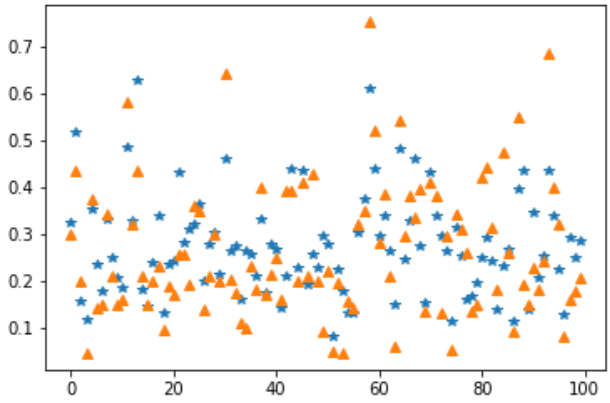


Fig 2: actual value predicted value

Fig 3: The graph below is the error in prediction of S02 and the actual value and the predicted value of the So2 is also given

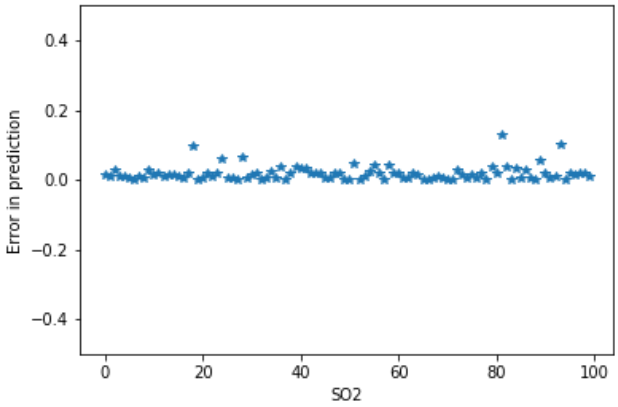


Fig4: The difference between the actual value and predicted value is shown below

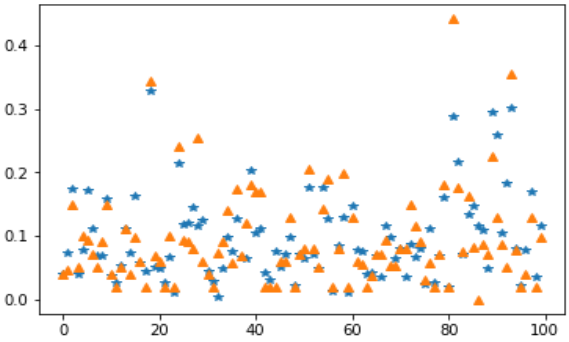


Fig 5: Actual value Predicted value

VIII. CONCLUSION

Preparation of quality data for accurate machine learning model and air pollution forecasting system designed in this paper proposed a good solution to predict the air pollution accurately. The analysis of air quality was discussed for the Indian climate with different air pollutants results of different cities. Data preparation produces clean and well-curated data that leads to more practical, accurate model outcomes. Using data preparation techniques and machine learning algorithm we have predicted the pollutants. This prepared data can also used in different machine learning algorithms.

IX. REFERENCES

[1]. Richard O. Sinnott, Ziyue Guan, "Prediction of Air Pollution through Machine Learning Approaches on the Cloud ".2018 IEEE/AC 5th International Conference on Big Data computing Applications and Technologies(BDCAT) Dec2018.

[2]. Arie Dipareza Syafei, Akimasa Fujiwara, and Junyi Zhang. "Prediction Model of Air pollutant levels using Linear Model with Component Analysis", international journal of environmental science and development, july2015.

[3]. Sameer Kumar, Dhruv Katoria. "Air Pollution and its Control Measures". International journal of environmental engineering and management. volume 4,pp.445-450, Nov. 5, 2013.

[4]. Chavi Srivastava, Shyamli Singh ; Amit Prakash Singh, "Estimation of Air Pollution in Delhi Using Machine Learning Techniques", International Conference on Computing, Power and Communication Technologies (GUCON), Sep 2017

[5]. Vincentius Timothy, Ary Setijadi Prihatmanto, "Data preparation step for automated diagnosis based on HRV analysis and machine learning,"2016 6th International Conference on System Engineering and Technology (ICSET), Feb 2017

[6]. Ying Zhang, Yanhao Wang, Minghe Gao, "A Predictive Data Feature Exploration-Based Air Quality Prediction Approach", IEEE ACCESS, Jan 2018

[7]. A Survey on Data Collection for Machine Learning – arxiv, https://arxiv.org ›

[8]. Jong Won Park, Hae Sun Jung,Yong Woo Lee Visualization of Urban Air Pollution with Cloud Computing, 2011 IEEE World Congress on Services, Sep 2011

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संस्कृत साहित्य में पर्यावरणीय चेतना और पर्यावरण संरक्षण

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भारतीय धर्म, दर्शन, अध्यात्म, संस्कृति और सभ्यता के उत्कर्ष का विराट् चिंतन भारतीय साधकों, ऋषियों, तपस्वियों और आचायों की महनीय मेधा का परिणाम है। ज्ञानालोक से आलोकित भारतीय ऋषि अद्‌वितीय वैज्ञानिक, अनुसंधानकर्ता, मानवता के अनन्य हित-चिंतक, दूरदृष्टि संपन्न पथ-प्रदार्शक थे। वे स्वाध्याय द्‌वारा इस सत्य से भलीभांति परिचित थे कि प्रकृति द्‌वारा स्थापित विधानांतर्गत कुछ भी निरर्थक नहीं है। सुर्य, हवा, जल, भूमि, वनस्पति, जीव-जंतु प्रकृति सभी एक-दूसरे के हित में सदैव सहयोगी बने रहते हैं। ये मनुष्य के शुभैषी हैं। अत: मनुष्य का नैतिक धर्म है कि वह इन पर्यावरणीय पदार्थों का यथोचित उपयोग करे और सदैव इनके संरक्षण में अनवरत लगे रहे।

वर्तमान-परिप्रेक्ष्य में जिस तरह से ग्लोबल वार्मिंग, परमाणु परीक्षण, बमवर्षक अस्त्रों से दहलती धरती, बढ़ता रेडिएशन और संपूर्ण जीवमंडल और पारिस्थितिकी में मानवीय हसतक्षेप निरंतर बढ़ रहा पर्यावरण के समक्ष एक गंभीर समस्या उत्पन्न हो गई हैं। पर्यावरण असंतुलन के कारण वैश्विक संरक्षण के उपायों को असफल बना रहा है। इधर, जलवायु परिवर्तन को रोकने के लिए हुआ पेरिस समझौता नहीं अमेरिका के इससे बाहर हो जाने के कारण अब इसकी प्रासंगिकता पर संदेश के बादल मंडराते लगे हैं। 121 सूर्य पुत्र देशों की बैठकों का कार्यान्वयन और कार्बन-उत्सर्जन पर विकासशील और विकसित देशों के परस्पर आरोप-प्रत्यारोपों के बीच यह सदी पर्यावरण के असाधारण युद्‌ध को समय के पन्नों पर दर्ज करती जा रही है। और मनुष्य सिर पर हाथ धर कर बैठा है। जैसे उसको लगता है कि पर्यावरण प्रदूषण कोई समस्या है ही नहीं है।

पर्यावरण शब्द जिस अर्थ में प्रयुक्त हो रहा है, अब से तीन-चार दशक पूर्व उसका ऐसा कोई पारिभाषिक अर्थ नहीं था। प्राचीन कोशों में और यहां तक कि संस्कृत हिंदी कोशों में भी यह शब्द उपलब्ध नहीं होता। उसके पीछे मूल कारण यही है कि यह शब्द उस समय तक किसी पारिभाषिक रूप से प्रचलित नहीं हो पाया था। अतएव प्राचीन कोशकारों ने इसका कोई विशेष अर्थ प्रस्तुत नहीं किया।पर्यावरण एक व्यापक शब्द है। यह उन संपूर्ण शक्तियों, परिस्थितियों एवं वस्तुओं का योग है, जो मानव जगत को परावृत्त करती हैं तथा उनके क्रियाकलापों को अनुशासित करती हैं। हमारे चारों ओर जो विराट प्राकृतिक परिवेश व्याप्त है, उसे ही हम पर्यावरण कहते है।

पर्यावरण शब्द की व्युत्पत्ति पर अगर विचार करे तो यह परि और आ उपसर्ग पूर्वक वृ धातु से लयुट प्रत्यय करके बना है।जिसका अर्थ होता है एक आवरण जो चारो तरफ से आवृत हो।शब्दार्थ-कौस्तुभ ग्रंथ में हमें प्राप्त होता है, जिसका अर्थ है, 'ढकना, छिपाना, घेरना, ढक्कन, पर्दा, घेरा, चारदीवारी, वस्त्र, कपड़ा और ढाल (वही, पृ. 200)।इस आधार पर जो कुछ हमारे चारों ओर जो भी वस्तुएं परिस्थितियां एवं शक्तियां विद्यमान हैं, वे सब हमारे क्रियाकलापों को प्रभावित करती हैं और उसके लिए एक दायरा सुनिश्चित करती हैं। इसे हम पर्यावरण कह सकते हैं।इसीलिए वेदकालीन मनीषियों ने द्युलोक से लेकर व्यक्ति तक, समस्त परिवेश के लिए शांति की प्रार्थना की है। शुक्ल यजुर्वेद में ऋषि प्रार्थना करता है।

द्यौ: शान्तिरन्तरिक्षं शान्ति: पृथिवी शान्ति राप: शान्ति रौषधय: शान्ति।
वनस्पतय: शान्तिर्विश्वेदेवा शान्तिर्ब्रह्मं शान्ति: सर्वशान्तिदेव शान्ति: सामा शान्तिरेधि।1

यही कारण रहा था कि मनीषियों द्वारा समय-समय पर पर्यावरण के प्रति अपनी चिंता को अभिव्यक्त कर मानव – **जाति** को सचेष्ट करने के प्रति अपने उत्तरदायित्व का निर्वाह किया गया है।वैदिक ऋषियों ने उन समस्त उपकारक तत्वों को देव कहकर संबोधित किया साथ ही उनके महत्व को स्वीकार किया है। वेदों में पर्यावरण को संतुलित रखने के लिए जिन देवताओं की महत्वपूर्ण भूमिका को रेखांकित किया गया है उनमें – सूर्य, वायु, वरुण (जल) एवं अग्नि देवता प्रमुख है। इन देवताओं हमारे जीवन की रक्षा की कामना की गई है। ऋग्वेद (1/158/1, 7/35/11) तथा अथर्ववेद (10/9/12) में दिव्य, पार्थिव और जलीय देवों से कल्याण की कामना स्पष्ट रूप से उल्लिखित है।जन सामान्य में श्रद्धाभाव जागृत कर प्रकृति के समस्त रूपों को अशांत अर्थात् सांप्रतिक परिप्रेक्ष्य में प्रदूषित न करने की प्रेरणा दी। साथ ही जीवन के प्रति संकट में बन रहें प्रदूषण से सजग रहने के लिए न केवल सत्परामर्श दिया, अपितु प्रेरित भी किया। इसी क्रम में मैत्री भावना स्थापित करने के लिए मंत्र पाठ का विधान किया गया है।

मित्रस्य मा चक्षुषा सर्वाणि भूतानि समीक्षंताम।
मित्रस्याहं चक्षुषा सर्वाणि भूतानि समीक्षे।मित्रस्य
चक्षुषा समीक्षामहे।।2

इन वैदिक मंत्रों से यह ज्ञात होता है कि वे ऋषि गण पर्यावरण के प्रत्येक रूप की संरक्षा एवं संतुलन के प्रति कितने सजग थे। यहीं कारण रहा होगा कि न केवल मनुष्य की मैत्री-भावना की कल्पना की, अपितु मनुष्य के प्रति प्रकृति की और प्रकृति के प्रति मनुष्य की मैत्री-भावना को व्यावहारिक धरातल पर चरितार्थ किया।प्रदूषण मुक्त वायु के लिए पवनदेव से प्रार्थना की गई-

शं नो वात: पवताङ।3
अर्थात् हे पवनदेव: वायु हमारे सिए शुद्ध होकर बहे।

आज मनुष्य मृदा संरक्षण और मरुस्थलीकरण को रोकने के लिए मानव COP 14 संरक्षण के माध्यम से भूमि को पुनः जीवित करने का प्रयास कर रहा है। हमारे मुनियों ने आज से कई हजार साल पहले ही जानते थे की यदि मृदा संरक्षण के ऊपर ध्यान न दिया जाए तो भविष्य में संकट का सामना करना पड़ सकता है इसलिए वह संरक्षण की दिशा में एक कदम बढ़ाते हुए देवता से प्रार्थना में कहा गया है कि-

पृथिवीं यच्छ पृथिवीं दृङह पृथिवीं मा हिङसी।।4

अर्थात् मृदा को उर्वर बनाएं तथा उसके प्रति हिंसा (प्रदूषण) न करें।

एक मंत्र में भारतीय ऋषियों ने बादलों से कामना की है कि वे हमारे लिए सुखकारी हों तथा प्रभूत मात्रा में जल वर्षण करें जिससे हम वर्ष भर भोजन , जल संकट आदि समस्या का सामना न करना पड़े-

शंयोरिभि स्त्रवंतुन:।5

स्कन्द पुराण में, भविष्योत्तर पुराण में तथा अन्य पुराणों में भी तुलसी, पीपल तथा बेल इत्यादि वृक्षों इत्यादि वृक्षों में धार्मिक माहात्म्य के द्वारा जल सिंचन का प्रावधान है जो हमारी धार्मिक-मान्यताओं में आज भी प्रचलित है।आर्ष साहित्य में पीपल, वट, तुलसी प्रभृति वृक्षों को पूजनीय बतलाया गया है । इनके गुणों के कारण उनके काटने का निषेध किया गया हैं। वट, पीपल आदि को देवता के समान बताया गया हैं। वटवृक्ष के मूल में भगवान् ब्रह्मा, मध्य में भगवान् जनार्दन तथा अग्रभाग में देवाधिदेव शिव की प्रतिष्ठित रहने की कल्पना की गई हैं। इसी प्रकार देवी सावित्री का निवास स्थान भी वटवृक्ष में ही स्वीकार किया गया हैं-

वटमूले स्थितो ब्रहमा वटमध्ये जनार्दन:।

वटाग्रे तु शिवो देव: सावित्री वटसंश्रिता।।5

इसी प्रकार पीपल के मूल में भगवान् ब्रहमा, त्वचा में भगवान् विष्णु, शाखा में भगवान् शिव एवं पत्र में देवताओं का अधिवास की बात ऋषि गण करते है।

मूले ब्रह्मा त्वचा विष्णु: शाखा शंकरमेव च।

पत्रे-पत्रे देवानाम वासुदेव नमस्तुते।।6

पीपल वृक्ष को श्रीहरि का स्वरूप माना जाता रहा है।

अश्वत्थ: सर्ववृक्षाणाम्।7

छांदोग्योपनिषद्, में पीपल वृक्ष की महत्ता को व्यक्त करता हुए कहा गया है कि संपूर्ण संसार अश्वत्थ (पीपल) के समान ही है-

अस्य सोम्य महतो वृक्षस्य यो मूले Sभ्यहन्याज्जीवन् **स्त्रवेद्यो...**

स एष जीवेनात्मनानुप्रभूत: पेपीयमानो मोदमानस्तिष्ठति।।8

अर्थात् हे सौम्य! यदि कोई इस महान् वृक्ष के मूल में आघात करे तो वह जीवित रहते हुए भी केवल रसस्त्राव करेगा। यह वृक्ष जीव-आत्मा से ओत-प्रोत है और जल-पान करता हुआ आनंदपूर्वक स्थिर है।

इसी प्रकार गीता में मानव के स्नायु-संस्थान की उपमा उपमा अश्वत्थ से की गई है-

ऊधर्वमूलमध: शाखमश्वत्थं प्राहुरव्ययम्।9

हमारे ऋषि जानते थे कि पृथ्वी पर जीवन आधार जल और जंगल है ।इनके बगैर पृथ्वी पर जीवन की कल्पना भी नहीं की जा सकती. इसलिए उन्होंने पृथ्वी की रक्षा के लिए वृक्ष और जल को महत्वपूर्ण माना ।गीता में कहा गया है-

'वृक्षाद् वर्षति पर्जन्य: पर्जन्यादन्न सम्भव:' 10

अर्थात् वृक्ष जल है, जल अन्न है, अन्न जीवन है.

हमारे प्राचीन ऋषि लोगों ने अपना सम्पूर्ण जीवन इन्हीं जंगलों में बिताया, इन्हीं से इनको के जीव तथा अजीव सत्ता का ज्ञान हुआ।यही कारण था कि उनको यह जंगल आनंददायक लगता था।अभिज्ञान शाकुन्तल के पांचवे अंक में ऋषि कुमार जब दुष्यंत के राजमहल में जाते है तो उनको वह आग से लिपटे हुए घर के समान लगता है। कहा भी गया हैं-

'अरण्यं ते पृथिवी स्योनमस्तु' ।11

इसके अतिरिक्त जीवन के चार महत्वपूर्ण आश्रमों में से तीन ब्रह्मचर्य, वानप्रस्थ और संन्यास का सीधा संबंध वनों से ही है.

ऋग्वेद में उल्लेखित है कि , 'वनं आस्थाप्यध्वम्' अर्थात् वन में वनस्पतियाँ उगाओ, वृक्षारोपण करो । वानस्पतिक संपदा के भंडार में वृद्धि करो, उसे घटाओ नहीं । यजुर्वेद के एक सूत्र में कहा गया है कि हे वनस्पति ! इस धारदार कुल्हाड़े से अपने महान सौभाग्य के लिए मैंने तुम्हें काटा अवश्य है, परंतु तेरा उपयोग हम सहस्र अंकुर होते हुए करेंगे।

महाभारत के शांति पर्व के 184वें अध्याय में महर्षि भारद्वाज व महर्षि भृगु का संवाद है । इस संवाद में स्पष्ट वर्णन है कि कि वृक्ष पंचभौतिक अवचेतन हैं । हमारी संस्कृति में नीम को पूर्ण चिकित्सक, आंवले को पूर्ण भोजन, पीपल को शुद्ध वायुदात्री, पाकड़ और वट के युग्म वृक्षों को जल संग्राहक एवं वट को पूर्ण घर माना गया है।

पर्यावरण और अध्यात्म दोनों का अन्योन्याश्रित सम्बन्ध है। ऋषिगणों के समय में यह सम्बन्ध अविच्छिन्न बना रहा इसी कारण कभी भी दैवी आपदाएं प्राकृतिक विभीषिकाओं की बहुलता नही रही।हमारे ऋषिगण विश्वराष्ट्र की बात कहते थे एवं उसे पुष्ट बनाने का निर्देश देते थे। ''माता भूमिः पुत्रोऽहं पृथिव्याः''(अथर्ववेद 12.1.12) के रूप में एक अतिमहत्वपूर्ण सूत्र हमें ऋषियों ने दिया । आज चारों ओर वृक्षों का विनाश हो रहा है, इसी कारण सभी प्रकार की

विपत्तियां हम पर बरस रही है। भूमि का कटाव उपजाऊ मिट्टी का क्षरण होकर उसका समुद्र में बहकर चले जाना एवं क्रमशः कवच हटते चले जाने से पृथ्वी का तापमान बढ़ना इसी कारण से हो रहा है।वृक्षों से संसार के पर्यावरण का कितना बड़ा कल्याण होता है इसका सही अनुमान सामान्य जन नहीं कर पाते।

पुराण साहित्य में वृक्षों को ''तरू'' की संज्ञा दी गई है जिसका अर्थ होता है तारने- वाला । पुराण में तरू को वृक्षों के पर्यायवाची के रूप में स्वीकार किया गया किन्तु तरू का शाब्दिक अर्थ होता है तारने वाला। वृक्ष रोपण करने वाले व्यक्ति को नरक से बचाता (तारता) हैं, इसलिए उसको तरू कहते है। तरू शब्द की व्याख्या ''वाचस्पत्यम्'' शब्द कोष में इस प्रकार है-

तरन्त्यनेन नरकमारोपकाः इति तरूः (पु0)

तृ- उन् (रोपणकर्ता को नरक से तारते हैं)।12

''अमरकोश'' की रामाश्रमी टीका के अनुसार तरू की व्याख्या -

तरूः तरति। तरन्त्यनेन इति वर तृ प्लवनसंतरणयोः'।13

''शब्दकलपद्रुम'' के अनुसार तरू की व्युत्पत्ति-

तरूः- तरति समुद्ददिकमनेनेति।14

अग्निपुराण में कहा गया हैः-

सतपुत्रेण मुनिश्रेष्ठाः समुत्पन्नेन दुम्मतिः।

उत्तताराान्वियात् स्वर्गे पुन्नामनरकाद्द्रुतम्।।15

हे मुनिश्रेष्ठ। बुरे व्यक्ति के भी सत्पुत्र उत्पन्न हो जाने से उसे पुत् नरक से रक्षा व स्वर्ग की प्राप्ति होती है।
आज भी वृक्षों की महत्ता उतनी ही है जितनी आज से पूर्व थी। समुद्र के किनारे उगने वाले मैंग्रोव वनों के कारण सुनामी , समुद्री तूफान, और बाढ़ जैसे हालात को रोका जा सकता है। इसी कारण वृक्षों के विकास के लिए मंगलानुशंसा की जाती थी । आज भी हमारे समाज में मनाई जाने वाली होली , छठ, ओनम, पोंगल , और बहुत सारी त्यौहार का सीधा संबंध इन्हीं फसलों या किसी न किसी वृक्ष से अवश्य रहता है। उन्हें सुखी जीवन के लिए अपरिहार्य माने जाते है-

वनस्पते शतवल्शो वि रोह

सहस्त्रवल्शा वि वयं रुहेम।

यं त्वामयं स्वधितिस्तेजमानः

प्रणिनाय महते सौभगाय।।

इसी प्रकार ऋषियों ने वनस्पतियों और औषधियों के गुणों की वृद्धि के लिए मंत्रों का विधान किया है-

यः सुपर्णा आङ्गिरसीर्दिव्या या रघटो विदुः।
वयांसि हंसा या विदुर्याश्च सर्वे पतत्रिणः।।

जल हमारे जीवन का प्रमुख तत्त्व है। जल की महत्ता को लेकर एक बात कहीं जाती है कि
"जल ही जीवन है। " वर्तमान समय में जिस तरह जल का संकट गहराता जा रहा है इसको देख कर यही लगता है कि अगला विश्व युद्ध जल को लेकर ही होगा। वर्तमान समय में देखे तो हालात आज ऐसे ही है कावेरी नदी के पानी को लेकर कर्नाटक और तमिलनाडु में लाखों लोगों की जान चली गई। आज जल की शुद्धता-स्वच्छता को बनाए रखने की सबसे अधिक आवश्कता है। इसलिए, वेदों में अनेक सन्दर्भों में उसके महत्त्व पर पर्याप्त प्रकाश डाला गया है।

ऋग्वेद (1.23.248) में 'अप्सु अन्तः अमृतं, अप्सु भेषजं' मंत्रों के द्वारा जल का वैशिष्ट्य बताया गया है। जल में अमृत है, जल में औषधि-गुण विद्यमान रहते हैं।

अथर्ववेदीय पृथ्वीसूक्त में जलतत्त्व पर विचार करते हुए कहा गया है जल की शुद्धता स्वस्थ जीवन के लिए नितान्त आवश्यक है।
'शुद्धा न आपस्तन्वे क्षरन्तु'।
-(अथर्ववेद, 12.1.30)

जल-सन्तुलन के कारण ही भूमि में अपेक्षित सरसता , पृथ्वी पर हरीतिमा वृक्षों की छाया बनी रहती है।वातावरण में उत्साह दिखाई पड़ता है और प्राणियों का जीवन सुखमय तथा आनन्दमय बना रहता हैः
'वर्षेण भूमिः पृथिवी वृतावृता सानो दधातु भद्रया प्रिये धामनि धामनि'
-(अथर्ववेद, 12.1.52)

स्वच्छ वायु मनुष्य के जीवन को सबसे अधिक प्रभावित करता है। अभी हाल ही में आई WHO में की एक रिपोर्ट मै कहा गया है कि भारत में प्रदूषित वायु के कारण 12 लाख लोगों की जाती है। जो किसी भी और रोग से मरने वालों की संख्या से कहीं ज्यादा है। वेदों में स्वच्छ वायु की प्राप्ति के लिए वायु देव की स्तुति की गई है, जिससे जीवों का निरन्तर सम्यक् विकास होता रहेः

भक्षुसा सर्वाणि भूतानि समीक्षे'
यजुर्वेद (36.18)

लोकोक्ति 'जब तक सांस, तब तक आस। इसी बात को स्पष्ट करती है यह सत्य है कि जब सांस ही जहरीली हो जाए, तब उससे जीवन की आशा क्या की जा सकती है? वस्तुतः सांस की सार्थकता वातावरण की प्रदूषण मुक्त स्वच्छ वायु में निहित है।आज पेड़-पौधों की निर्ममता-पूर्वक कटाई से वातावरण में कार्बन-डाइऑक्साइड की मात्रा में अतिशय वृद्धि हो रही है। इससे तापमान अनपेक्षित मात्रा में बढ़ता जा रहा है, जो पर्यावरण के लिए संकट का सूचक है।

अथर्ववेद के भूमि सूक्त में पर्यावरणीय मूल्यों का विधान है । मनुष्य धरित्री (भूमि) से कहता है, ''मैं आपके उत्खनन से कुछ प्राप्त कर रहा हूँ, पर मैं ऐसा कभी न करूं कि इस प्रक्रिया से आपके हृदय अर्थात् मर्मस्थल पर चोट पहुँच जाए ।" अर्थात् उत्खनन करते समय दोहन करना शोषण करना नहीं ।

आज लोग धन के लोभ के कारण मनुष्य विकास के लिए जंगल,नदियों , खनिजों का अंधाधुंध दोहन कर रहा है जिसके कारण मै आकर प्रकृति में परिवर्तन आ रहा है, जिसका परिणाम यह है की पृथ्वी का मिजाज बदल रहा है। कहीं जल संकट तो कहीं अत्यधिक बाढ़, कहीं अत्यधिक गर्मी तो कहीं अत्यधिक ठंडी की स्थिति बन गई है।आज अमेरिका और यूरोप में इस साल वहां तापमान - 30 तक पहुंच गया (जिसको वहां पोलर वर्टेक्स कहा गया) वहीं आस्ट्रेलिया में भयंकर गर्मी के कारण ऑस्ट्रलियन ओपन को बीच में ही रोकना पड़ा।

इसी लिए **ईशोपनिषद् में कहा गया है कि "ईशावास्यमिदं सर्वं यत्किंचित् जगत्यां जगत् । तेन त्यक्तेन भुंजीथा मा गृधः कस्यस्विद्धनं ।।"16 श्रीमद्भगवद्गीता में भी श्रीकृष्ण जी कहते है, "धर्मविरुद्धो भूतेषु कामोऽस्मि भरतर्षभ:"17 अर्थात् जहाँ भोग धर्म की अवमानना नहीं करता वह दिव्य है । प्रकृति का भोग भी करना है तो धर्म का पालन करते हुए करना है यानि प्राणी मात्र के कल्याण का भाव सदा बना रहे ।**

हमारे संस्कृत साहित्य में न केवल वृक्ष ,वायु, जल संरक्षण की बात कही गई बल्कि पर्वत को भी संरक्षित करने की बात कही गई है।महाकवि कालिदास ने 'कुमारसम्भवम्' में हिमालय की महानता और देवत्व को बताते हुए कहा है – **"अस्तुस्तरस्यां** दिशि देवतात्मा हिमालयो नाम नगाधिराज:।18" भारत में मानसून के विकास और प्रस्फुटन में हिमालय का महत्पूर्ण योगदान है।साथ ही यह साइबेरिया से आने वाली ठंडी हवाओं को रोक कर भारत को शीत मरुस्थल बनने से भी रोकता है।इसके अलावा यह लाखों औषधि का आश्रय स्थल है।

वैज्ञानिक ने पर्यावरण की शुद्धि के लिए प्रकृति को मानव की सर्वाधिक सहयोगिनी मानते हुए विशेष रूप से वन एवं वृक्षों के महत्व को स्वीकार किया है। विश्व के प्राचीनतम ग्रन्थ वेद में मन्त्रद्रष्टा ऋषियों ने हजारों वर्ष पूर्व उपर्युक्त तथ्य का दर्शन कर लिया था। वैदिक संहिताओं में पर्यावरण की शुद्धि के लिए वन, वृक्ष एवं वनस्पतियों को उपयोगी मानते हुए उनके महत्व का निरूपण किया गया है। मन्त्रद्रष्टा ऋषिगण इस तथ्य को भलीभाँति जानते थे

कि वृक्ष एवं लताएँ आदि जहाँ अपने फल, फूल एवं लकड़ी आदि द्वारा समृद्धि प्रदान करते हैं वहाँ शुद्ध एवं प्राणदायक वायु द्वारा पर्यावरण को भी माधुर्य गुणयुक्त बनाते हैं। अतः ऋग्वेद में इनके संरक्षण पर जोर देते हुए कहा गया है कि वृक्ष प्रदूषण को नष्ट करते है।

पर्यावरण को स्वच्छ और स्वस्थ रखने में पौधों की महत्ता वेदों के साथ ही साथ लौकिक साहित्य में नजर आती है। शाकुन्तल नाटक के पहले अंक में कालिदास के द्वारा जैसा वन जीवन का वर्णन किया है वह उस समय के लोगों के पर्यावरण प्रेम को अभिव्यक्त करता है।साथ ही इसमें वनस्पतियों के प्रति जिस स्नेहिल भावना की अभिव्यक्ति हुई है वह उस समय के पर्यावरण चेतना का सर्वोष्कृष्ट स्वरूप प्रस्तुत करता है। वृक्षों को पुत्र रूप से प्रतिष्ठा तथा इससे भी बढ़कर उनके प्रति कृतज्ञता एवं श्रद्धा का भाव प्रायः प्रत्येक पुराण में मिलता है। सर्वप्रथम महाभारत में वृक्षों को धर्मपुत्र मानकर इनके संरक्षण एवं संवर्धन को अत्यन्त श्रेयस्कर बताया गया है। महाभारत के मोक्ष धर्म पर्व में तो वृक्षों को सजीव प्राणी के रूप में वर्णित किया गया है।

यजुर्वेद में वृक्ष, वन एवं औषधियों का संरक्षण एवं संवर्धन करने वालों को भी उनके इस कार्य के कारण नमस्कार किया गया है।

'वनानां पतये नमः'
'औषधीनां पतये नमः
(यजुर्वेद० 16-18 एवं **19)**

वृक्षों एवं वनस्पतियों के सम्पर्क से वातावरण को प्राणवान एवं मधुमय बना देने वाले वायु को एक मन्त्र में विष्वभेषज कहा गया है और प्रार्थना की गई है कि वह दूषित वायु को दूर करें तथा शुद्ध वायु 'भेषजवात्' को प्रवाहित करें-

'अग्निः कृणोतु भेषजम्'
(अथर्व० 8-106-3)

पर्यावरण का स्वच्छ एवं सन्तुलित होना मानव सभ्यता के अस्तित्व के लिए आवश्यक है। पाश्चात्य सभ्यता को यह तथ्य बीसवीं शती के उत्तारार्ध्द में समझ में आया है, जबकि भारतीय मनीषा ने इसे वैदिक काल में ही अनुभूत कर लिया था। हमारे ऋषि-मुनि जानते थे कि पृथ्वी, जल, अग्नि, अन्तरिक्ष तथा वायु इन पंचतत्वों से ही मानव शरीर निर्मित है-

पंचस्वन्तु पुरुष आविवेशतान्यन्तः पुरुषे अर्पितानि।1

ऋग्वेद का नदी सूक्त एवं पृथिवी सूक्त तथा अथर्ववेद का अरण्यानी सूक्त क्रमश: नदियों, पृथिवी एवं वनस्पतियों के संरक्षण एवं संवर्धन की कामना का संदेश देते हैं। भारतीय दृष्टि चिरकाल से सम्पूर्ण प्राणियों एवं वनस्पतियों के कल्याण की आकांक्षा रखती आई है। 'यद्पिण्डे तद् ब्रह्माण्डे' सूक्ति भी पुरुष तथा प्रकृति के मध्य अन्योन्याश्रय सम्बन्ध की विज्ञानपुष्ट अवधारणा को बताती है।अथर्ववेद में पृथिवी पर शुद्ध पेय जल के सर्वदा उपलब्ध रहने की ईश्वर से कामना की गयी है-

शुद्धा न आपस्तन्वे क्षरन्तु यो न: सेदुरप्रिये तं नि दध्म:।
पवित्रेण पृथिवि मोत् पुनामि॥19

बृहदारण्यकोपनिषद में जल को सृजन का हेतु स्वीकार किया गया है और कहा गया है कि पंचभूतों का रस पृथ्वी है, पृथ्वी का रस जल है, जल का रस औषधियाँ हैं, औषधियों का रस पुष्प हैं, पुष्पों का रस फल हैं, फल का रस पुरुष हैं तथा पुरुष का रस वीर्य है, जो सृजन का हेतु है।16

भारतीय मनीषा की दृष्टि में जलस्त्रोत केवल निर्जीव जलाशय मात्र नहीं थे, अपितु वरुण देव तथा विभिन्न नदियों के रूप में उसने अनेक देवियों की कल्पना की थी।13 इसी कारण स्नान करते समय सप्तसिन्धुओं में जल के समावेश हेतु आज भी इस मंत्र द्वारा उनका आह्वान किया जाता है-

गंगे च यमुने चैव गोदावरि सरस्वति।
नर्मदे सिन्धु कावेरी जलेऽस्मिन सन्निधिम् कुरु॥20

जैन शास्त्रों में जलशुद्धि एवं मितव्यतिता पर विशेष बल दिया है। जल का उपयोग छानकर एवं उबालकर करना श्रावकों को कर्तव्य बताया है। आज स्थान–स्थान पर एकत्रित जल में उत्पन्न दलदल, सीलन, सड़न, रोगाणुओं की उत्पत्ति, भूमि, जल और वायु प्रदूषण का बहुत बड़ा कारण अनावश्यक जल और दूषित पदार्थों को प्रवाहित करना ही है.

वैदिक ऋषियों ने वैज्ञानिकों की तरह जल एवं वायु को प्रदूषण - मुक्त करने की बात कही है । यजुर्वेद में उन्होंने यह परामर्श भी दिया है कि हम वर्षा - जल को भी , किस प्रकार औषधीय गुणों से परिपूर्ण कर सकते हैं ।

"**अपो देवीरुपसृज मधुमतीरयक्ष्मार्य प्रजाभ्य: ।**
तासामास्थानादुज्जिहतामोषधय: सुपिप्पला: । । "
यजुर्वेद / ११ / ३८ /

पर्यावरण संरक्षण के लिये वैदिक युग में नदियों के देवत्व वाला स्वरूप उभरकर हमारे समक्ष उपस्थित हुआ था। नदी सूक्त में कहा गया है –

गंगे च यमुने चैव गोदावरि सरस्वती।
नर्मदे सिंधु कावेरि जलेऽस्मिन् सन्निधिं कुरु ।

हे गंगा, हे यमुना, आदि नदियों तुम मेरे स्रोत सुनो! गंगा के प्रति विशेष आदर अवश्य रहा, किंतु एक समय था, जब स्वयं गंगा नदी शब्द नदी मात्र का द्योतक था – सभी नदियाँ गंगा थी। नदी मात्र के प्रति जो आत्मीयता थी वह आज भी सुरक्षित है

भारतीय संविधान और पर्यावरण संरक्षण

भारत प्राचीन समय से ही पर्यावरण संरक्षण को लेकर सदैव सजग रहा, इसी कारण उसने संवैधानिक स्तर पर भी पर्यावरण संरक्षण की तरफ ध्यान दिया। हमारे देश में पर्यावरण के अनुकूल एक समृद्ध संस्कृति भी रही है यही कारण है कि देश में हर स्तर पर पर्यावरण संरक्षण के प्रति ध्यान दिया गया और हमारे संविधान निर्माताओं ने इसका ध्यान रखते हुए संविधान में पर्यावरण की जगह सुनिश्चित की। पर्यावरण को संवैधानिक स्तर पर मान्यता देते हुए इसे सरकार और नागरिकों के संवैधानिक दायित्व से जोड़ा गया।

भारतीय संविधान विश्व का पहला संविधान है जिसमें पर्यावरण संरक्षण के लिए विशिष्ट प्रावधान है। बीसवी सदी के मध्य में लिपिबद्ध भारतीय संविधान के ऐतिहासिक दस्तावेज में पर्यावरण संबंधी उपबंध तत्कालीन भारतीय मनीषा का प्रतिनिधित्व करने वाले संविधान निर्माताओं के पर्यावरण के परिरक्षण एवं संरक्षण के प्रति संवेदनशीलता, जागरूकता एवं दूरदर्शिता का परिचायक है। देश की संसद द्वारा समयानुकूल पर्यावरण संरक्षण एवं संवर्धन हेतु संविधान में संशोधन करते हुए विधियों का निर्माण किया गया है।

हमारे संविधान की प्रस्तावना समाज के सामाजवादी तरीके और प्रत्येक व्यक्ति की गरिमा सुनिश्चि करती है । यद्यपि भारतीय संविधान की प्रस्तावना में प्रत्यक्ष रूप से पर्यावरण के बारे में कुछ नहीं कहा गया है, तथापि जिस समाजवादी राज्य की परिकल्पना की गई है वह तभी सम्भव है जब सभी का जीवन स्तर ऊँचा हो। यह सत्य है कि सभी का जीवन स्तर केवल स्वच्छ पर्यावरण, अर्थात् प्रदूषण रहित पर्यावरण में ही सम्भव है। मूलाधिकारों में भी प्रत्यक्ष रूप से पर्यावरण के बारे में कोई प्रावधान नहीं है, लेकिन कुछ मूलाधिकारों में पर्यावरण को अप्रत्यक्ष रूप से समाहित किया गया है।प्रारंभ में पर्यावरण संरक्षण के संबंध में प्रावधान नहीं था लेकिन अनुच्छेद 47 द्वारा स्वास्थ्य की उन्नति हेतु राज्य का कर्तव्य अधिरोपित कर पर्यावरण सुधार किया गया। संसद द्वारा 42वें संवैधानिक संशोधन

द्वारा पर्यावरण संरक्षण के लिये अधिनियमों को पारित करके संविधान के भाग 4 में राज्य के नीति निर्देशक एवं मूल कर्तव्यों में सम्मिलित किया गया है इसके अंतर्गत कहा गया है –

1.अनुच्छेद 47 कहता है कि लोगों के जीवन स्तर को सुधारना, उन्हें भरपूर पोषण मुहैया कराना और सार्वजनिक स्वास्थ्य की वृद्धि के लिए काम करना राज्य के प्राथमिक कर्तव्यों में शामिल हैं। सार्वजनिक स्वास्थ्य में सुधार के तहत पर्यावरण संरक्षण और उसमें सुधार भी शामिल हैं क्योंकि इसके बगैर सार्वजनिक स्वास्थ्य को सुनिश्चित नहीं किया जा सकता है।

2. अनुच्छेद 48 कृषि एवं जीव संगठनों के संरक्षण की बात करता है। यह अनुच्छेद राज्यों को निर्देश देता है कि वे कृषि व जीवों से जुड़ों धंधों को आधुनिक व वैज्ञानिक तरीके से संगठित करने के लिए जरूरी कदम उठाएं। विशेषतौर पर, राज्यों को जीव-जन्तुओं की प्रजातियों को संरक्षित करना चाहिए और गाय, बछड़ों, भेड़-बकरी व अन्य जानवरों की हत्या पर रोक लगानी चाहिए।

3.संविधान का अनुच्छेद 48-A कहता है कि राज्य पर्यावरण संरक्षण व उसको बढ़ावा देने का काम करेंगे और देशभर में जंगलों व वन्य जीवों को को की सुरक्षा के लिए काम करेंगे।

4. संविधान के भाग 4क के अनुच्छेद 51 में मूल कर्तव्यों में प्राकृतिक पर्यावरण की जिसके अंतर्गत वन, झील, नदी अन्य जीव भी हैं इनकी रक्षा करें और उनका संवर्धन करें तथा प्राणि मात्र के प्रति दया भाव रखें।

5.अनुच्छेद 51 A (g) कहता है कि जंगल, तालाब, नदियां, वन्यजीव सहित सभी तरह की प्राकृतिक पर्यावरण संबंधित चीजों की रक्षा करना व उनको बढ़ावा देना हर भारतीय का कर्तव्य होगा। साथ ही प्रत्येक नागरिक को सभी सजीवों के प्रित करुणा रखनी होगी।

6. भारतीय संविधान के अनुच्छेद-21 में कहा गया है कि प्रत्येक व्यक्ति को उन गतिविधियों से बचाया जाना चाहिए, जो उसके जीवन, स्वास्थ्य और शरीर को हानि पहुँचाती हो।

7.भारतीय संविधान के अनुच्छेदों 252 व 253 को काफी महत्त्वपूर्ण माना गया है, क्योंकि वे पर्यावरण को ध्यान में रखकर कानून बनाने के लिये अधिकृत करते हैं।

पर्यावरण संरक्षण : सरकारी प्रयास

संसद द्वारा भी पर्यावरण संरक्षण के लिये अनेक अधिनियम पारित किए गए हैं यथा –

- **वन्य जीवन संरक्षण अधिनियम (1972)**
- **जल प्रदूषण नियंत्रण अधिनियम (1974)**
- **वायुप्रदूषण नियंत्रण अधिनियम (1981)**

- पर्यावरण संरक्षण अधिनियम (1986)

- खतरनाक अपशिष्ट प्रबंधन एवं निष्पादन अधिनियम (1989)

- ध्वनि प्रदूषण नियमन एवं नियंत्रण अधिनियम (2000)

संसद ने पर्यावरण संरक्षण अधिनियम पारित करके सराहनीय प्रयत्न किए हैं। पर्यावरण एवं वन मंत्रालय ने भी पर्यावरण संरक्षण में महत्त्वपूर्ण अतुलनीय योगदान दिया है। वन एवं पर्यावरण मंत्रालय के इन ध्येयों में वनस्पतियों, वन रोपड़, जीव जंतुओं और वन्य जीवों का संरक्षण, प्रदूषण नियंत्रण एवं निवारण, पर्यावरण की सुरक्षा सुनिश्चित करना शामिल है। इन उद्देश्यों की प्राप्ति के लिये सरकारी प्रयास किए जा रहे हैं।

1. केंद्र सरकार द्वारा गोविंद वल्लभ पंत हिमालय पर्यावरण एवं विकास संस्था की स्थापना 1988 ई. में की गई।
2. भारत सरकार द्वारा राष्ट्रीय बंजर भूमि विकास बोर्ड की स्थापना 1985 में की गई।
3. केंद्र ने 1988 ई. में राष्ट्रीय वन तथा वन्य जीव संबंधी नीति का निर्माण किया गया।
4. केंद्र सरकार ने कुछ वन्य क्षेत्रों को संरक्षित कर दिया है।
5. केंद्र सरकार द्वारा 1985 ई. में गंगा को स्वच्छ रखने के उद्देश्य से गंगा सत्ता की स्थापना की गई।
6. पर्यावरण संरक्षण अधिनियम (1986) के अंतर्गत केंद्रीय प्रदूषण नियंत्रण एवं निवारण बोर्ड की स्थापना की गई।
7. केंद्र सरकार द्वारा राष्ट्रीय पर्यावरण फेलोशिप की स्थापना 1995 ई. में की गई।

संसद के साथ-साथ न्यायपालिका ने संवैधानिक प्रावधान का पर्यावरणीय संदर्भ में निर्वाचन करके पर्यावरण संरक्षण एवं सुधार करने में महत्त्वपूर्ण योगदान दिया है। भारतीय संविधान के अंतर्गत मूल सिद्धांतों एक कल्याणकारी राज्य निर्माण के लिए काम करते हैं। स्वस्थ पर्यावरण भी कल्याणकारी राज्य का ही एक तत्व है। प्रत्येक व्यक्ति के विकास के लिए सबसे जरूरी मौलिक अधिकारों की गारंटी भारत का संविधान भाग-3 के तहत देता है। पर्यावरण के अधिकार के बिना व्यक्ति का विकास भी संभव नहीं है। अनुच्छेद 21, 14 और 19 को पर्यावरण संरक्षण के लिए प्रयोग में लाया जा चुका है।जीने के बेहतर मानक और प्रदूषणरहित वातावरण संविधान के भीतर अंतर्निहित है। पर्यावरण (संरक्षण) अधिनियम 1986 के अनुसार पर्यावरण में जल, हवा और जमीन और अंतरसंबंध जिसमें हवा समाहित हो, जल-जमीन और मानव, अन्य जीवित चीजें, पेड़-पौधे, सूक्ष्म जीवजंतु और संपत्ति आदि समाहित हैं।

संविधान के अनुच्छेद 21 के अनुसार कानून द्वारा स्थापित बाध्यताओं को छोड़कर किसी भी व्यक्ति को जीवन जीने और व्यक्तिगत आजादी से वंचित नहीं रखा जाएगा। मेनका गांधी बनाम भारत सरकार (AIR 1978 SC 597) संबंधी मुकद्दमें में सुप्रीम कोर्ट के निर्णय के बाद अनुच्छेद 21 की समय समय पर उदारवादी तरीके से व्याख्या की जा चुकी है। अनुच्छेद 21 जीवन जीने का मौलिक अधिकार भी देता है, इसमें पर्यावरण का अधिकार, बीमारियों व

संक्रमण के खतरे से मुक्ति का अधिकार अंतर्निहित हैं। स्वस्थ वातावरण का अधिकार प्रतिष्ठा से मानव जीवन जीने के अधिकार की महत्वपूर्ण विशेषता है। संविधान के अनुच्छेद 21 के तहत स्वस्थ वातावरण में जीवन जीने के अधिकार को पहली बार उस समय मान्यता दी गई थी, जब रूरल लिटिगेसन एंड एंटाइटलमेंट केंद्र बनाम राज्य, AIR 1988 SC 2187 (देहरादून खदान केस के रूप में प्रसिद्ध) केस सामने आया था। यह भारत में अपनी तरह का पहला मामला था, जिसमें सर्वोच्च न्यायालय ने पर्यावरण (संरक्षण) अधिनियम 1986 के तहत पर्यावरण व पर्यावरण संतुलन संबंधी मुद्दों को ध्यान में रखते हुए इस मामले में खनन (गैरकानूनी खनन) को रोकने के निर्देश दिए थे। वहीं एमसी मेहता बनाम भारतीय संघ, AIR 1987 SC 1086 के मामले में सर्वोच्च न्यायालय ने प्रदूषण रहित वातावरण में जीवन जीने के अधिकार को भारतीय संविधान के अनुच्छेद 21 के अंतर्गत जीवन जीने के मौलिक अधिकार के अंग के रूप में माना था।

बहुत अधिक शोर-शराबा भी समाज में प्रदूषण पैदा करता है। भारतीय संविधान का अनुच्छेद 19 (1) a व अनुच्छेद 21 प्रत्येक नागरिक को बेहतर वातावरण और शांतिपूर्ण जीवन जीने का अधिकार देता है। पीए जैकब बनाम कोट्टायम पुलिस अधीक्षक, AIR 1993 ker 1, के मामले में केरला उच्च न्यायालय ने स्पष्ट किया था कि भारतीय संविधान में अनुच्छेद 19 (1) (a) के तहत दी गई अभिव्यक्ति की स्वतंत्रता किसी भी नागरिक को तेज आवाज में लाउड स्पीकर व अन्य शोर-शराबा करने वाले उपकरण आदि बजाने की इजाजत नहीं देता है। इस प्रकार अब शोर-शराबे, लाउड स्पीकर आदि से होने वाले ध्वनि प्रदूषण को अनुच्छेद 19 (1) (a) के तहत नियंत्रित किया जा सकता है। भारतीय संविधान का अनुच्छेद 19 (1) (g) प्रत्येक नागरिक को अपनी पसंद के अनुसार किसी भी तरह का व्यवसाय, काम-धंधा आदि करने का अधिकार देता है। लेकिन इसमें कुछ प्रतिबंध भी हैं। अर्थात् कोई भी नागरिक ऐसा कोई भी काम नहीं कर सकता, जिससे समाज व लोगों के स्वास्थ्य पर कोई प्रतिकूल प्रभाव पड़े। पर्यावरण संरक्षण संविधान के इस अनुच्छेद में अंतर्निहित है। कोवरजी बी भरुचा बनाम आबकारी आयुक्त, अजमेर (1954, SC 220) के मामले में सुप्रीम कोर्ट ने स्पष्ट किया था कि जहां कहीं भी पर्यावरण संरक्षण व व्यवसाय करने के अधिकार के बीच कोई विरोध होगा तो कोर्ट को पर्यावरण संबंधी हितों और व्यवसाय व काम धंधा चुनने संबंधी अधिकार के बीच संतुलन बनाकर किसी निर्णय पर पहुंचना होगा।

भारत के संविधान के अनुच्छेद 32 और 226 के अंतर्गत जनहित याचिका पर्यावरण संबंधी याचिकाओं की धारा का ही परिणाम है । देहरादून में लाइमस्टोन खदान को बंद कराना (देहरादून खदान केस AIR 1985 SC 652), दिल्ली में क्लोरिन प्लांट में रक्षकों को लगवाना (एमसी मेहता बनाम भारतीय संघ, AIR 1988 SC 1037) आदि वो प्रमुख पर्यावरण संबंधी मामले हैं, जिनमें सर्वोच्च न्यायालय ने अभूतपूर्व और जनहित में निर्णय सुनाएं हैं। वेल्लोर नागरिक कल्याण फोरम बनाम भारतीय संघ (1996) 5 एससीसी 647 के मामले में सुप्रीम कोर्ट ने कहा था कि

पर्यावरण संरक्षण व वातावरण को शुद्ध रखने के लिए पूर्व सावधानियां रखकर ही विकास की राह पर आगे बढ़ पाना संभव है।

स्थानीय व ग्रामीण स्तर पर मृदा संरक्षण, जल प्रबंधन, जंगलों की सुरक्षा और पर्यावरण की रक्षा व इसको बढ़ावा देने के लिए पंचायतों को भी मजबूत बनाया जा चुका है।पर्यावरण की रक्षा हमारे सांस्कृतिक मूल्यों व परंपराओं का ही अंग है। अथर्ववेद में कहा भी गया है कि मनुष्य का स्वर्ग यहीं पृथ्वी पर है। यह जीवित संसार ही सभी मनुष्यों के लिए सबसे प्यारा स्थान है। यह प्रकृति की उदारता का ही आशीर्वाद है कि हम पृथ्वी पर बेहतर सोच और जज्बे के साथ जी रहे हैं। पृथ्वी ही हमारा स्वर्ग है और इसकी रक्षा करना हमारा कर्तव्य है। भारत के संविधान में भी प्रकृति के संरक्षण और रक्षा का ढांचा समाहित है, जिसके बिना जीवन का आनंद नहीं उठाया जा सकता है। पर्यावरण संरक्षण के प्रति लोगों की सहभागिता बढ़ाने, पर्यावरण जागरूकता, पर्यावरण संबंधी शिक्षा का विकास करने व लोगों को पर्यावरण के प्रति संवेदनशील बनाने के लिए पर्यावरण की रक्षा से जुड़े संवैधानिक प्रावधानों का ज्ञान लोगों को होना बेहद जरूरी है। यह आज की जरूरत भी है।

संरक्षण अधिनियम

वन्य जीवन की श्रेणी में सभी गैर पालतू जीव आते हैं; उनमें पक्षी, रेंगकर चलने वाले जीव, कीट और जल तथा थल के उभयचरी जीव आते हैं। पारिस्थितिक संतुलन बनाये रखने, मृदा क्षरण रोकने, खाद्य, औषधि, मसालों, पेयों, सुगंधों आदि के स्रोत के रूप में आर्थिक उत्पादों के स्रोत के रूप में, तथा उत्तम जातियों के प्रजनन के लिए वन्य जीवन अपरिहार्य है। वन्य जीवों की सुरक्षा एवं संरक्षण के लिए समय-समय पर कई नियम तथा कानून पारित किये गये हैं, जो निम्न है :

मद्रास वाइल्ड एलिफैण्ट प्रीजर्वेशन ऐक्ट, 1873
आल इण्डिया एलिफैण्ट प्रीजर्वेशन ऐक्ट, 1979
वाइल्ड बर्ड प्रोटेक्शन ऐक्ट, 1887
राइनोसेरस प्रीजर्वेशन ऐक्ट, 1932
असम राइनोसेरस प्रीजर्वेशन ऐक्ट, 1954
सेण्ट्रल बोर्ड ऑन वाइल्ड लाइफ 1952
वाइल्ड लाइफ प्रोटेक्शन एक्ट 1972

भारतीय वन्य जीव बोर्ड- वन्य जीव संरक्षण आधिनियम के अधीन 1985 में भारतीय वन्य जीव बोर्ड' की स्थापना की गयी जिसकी अध्यक्षता भारत के प्रधानमंत्री करते हैं। यह वन्य जीव संरक्षण की अनेक योजनाओं के क्रियान्वयन की निगरानी और निर्देश देने के लिए शीर्षस्थ सलाहकार एजेंसी है। अधिनियम के अधीन प्रत्येक राज्य के लिए एक वन्य जीवन सलाहकार बोर्ड का गठन किया गया है।

बोटेनिकल सर्वे ऑफ इण्डिया (BSI) तथा जूलॉजिकल सर्वे ऑफ इण्डिया (ZSI), दोनों संकट ग्रस्त दुर्लभ तथा आपदा ग्रस्त प्रजातियों की सूची तैयार करते हैं।

निष्कर्ष

वैदिक काल में भी पर्यावरण के प्रदूषित होने की समस्या उपस्थित हुई होगी ,समुद्र मन्थन को इसके उदाहरण के रूप में देखा जा सकता है। यह वास्तव में लोभ वश देवताओं एवं असुरों द्वारा प्रकृति का निर्दयतापूर्वक दोहन था, जिसके परिणाम स्वरूप अमृत के साथ-साथ हलाहल के रूप में प्रदूषण ही निकला ।वेद के द्वारा हम लोगो को स्पष्ट निर्देश है कि हम लोग प्रकृति के प्रति सदा पूर्ण श्रद्धा रखें और आनन्दमय जीवन व्यतीत करने के निमित्त पर्यावरण की अनुकूलता प्राप्त करें। शुक्ल-यजुर्वेद में कहा गया है कि-

"मधुयुक्त सरस-शुद्ध पवन गतिशील रहे, सागर मधुपूर्ण वर्षण करे। ओज प्रदान करने वाली अन्नादि वस्तुएँ भोजन के बाद मधुसदृश सुकोमल बन जाएँ। रात के साथ-साथ दिन भी मधुर रहे। पृथ्वी की धूल से लेकर अन्तरिक्ष तक मधुसंयुक्त हो। न केवल जीवित मनुष्यों का, अपितु पितरों का जीवन भी मधुमय रहे। सूर्य मधुमय रहें, गायें मधुर दूध देने वाली हों। निखिल ब्रह्नमाण्ड मधुमय रहे।"

-(शुक्ल **यजुर्वेद, 13.2729)**

इस प्रकार सार्वभौम मानव संस्कृति के आदि स्त्रोत वेदों में भौतिक एवं आध्यात्मिक दोनों ही दृष्टियों से पर्यावरण की शुद्धि के ऐसे साधनों का विधान किया गया है जिन्हें अपनाकर संसार में एक सुखी एवं आनन्दमय वातावरण बनाया जा सकता है। हम प्राचीन ऋषियों के मार्ग का अनुसरण करके ही इस स्नेहिल भावना को पुष्ट कर सकते हैं। तभी यह उद्घोषणा सार्थक सिद्ध होगी-

सर्वे भवन्तु सुखिनः सर्वे सन्तु निरामयाः।
सर्वे भद्राणि पश्यन्तु मा कश्चिद् दुःखभाण्यवेत्।।

''माता भूमिः पुत्रोऽहं पृथिव्याः"(अथर्ववेद 12.1.12) के रूप मे यह ज्ञान हमें ऋषियों ने दिया कि आज चारों ओर वृक्षों का विनाश हो रहा है, इसी कारण सभी प्रकार की विपत्तियां हम पर बरस रही है। भूमि का कटाव उपजाऊ मिट्टी का क्षरण होकर उसका समुद्र में बहकर चले जाना एवं क्रमशः कवच हटते चले जाने से पृथ्वी का तापमान बढ़ना इसी कारण से हो रहा है।वृक्षों से संसार के पर्यावरण का कितना बड़ा कल्याण होता है इसका सही अनुमान सामान्य जन नहीं कर पाते। भारतीय ऋषियों ने धर्मग्रन्थों में वृक्षों को संतान से भी अधिक महत्व दिया है। अपना कल्याण करने के लिए वृक्ष को संतान से भी अधिक महत्व दिया है। अपना कल्याण करने के लिए वृक्ष को पुत्र रूप में ग्रहण करने का विधान निर्धारण करना ऋषियों की इसी सोच का एक अंग है। इस विषय में मत्स्य पुराण स्पष्ट कहता है-

दशकूप समोवापी दशवापीसमोह्रदः।
दशह्रदसमः पुत्रो दशपुत्रसमः द्रुमः।। – विधान पारिजात खण्ड 4. अ0 49.

श्रीमद्भागवत् महापुराण दशमस्कन्ध के बीसवें अध्याय के 32.33.34वें श्लोक में भगवान श्रीकृष्ण ने ग्वालबालों को सम्बोधित करते हुए कहाः-

पश्येतान् महाभागान् परार्थैकान्तजीवितान्।
वातवर्षातपहिमान् सहन्तो वारयन्तिनः।।
अहो एषां वरं जन्म सर्वप्राण्युपजीवनम्।
सुजनस्येव येषां वै विमुखा यान्ति नार्थिनः।।
पत्र पुष्पफलच्छायामूल वल्कलदारूभिः।
गन्धनिर्यासभस्मास्थितोक्मैः कामान् वितन्वते।।

भारतीय ऋषियों ने जिन पुनीत सरिताओं को जीवनदायिनी एवं संस्कृति-स्रोतस्विनी कहा है, उन्हीं को वर्तमान मनुष्य ने स्वार्थ के वशीभूत होकर विषाक्त कर दिया है। बिहार की प्रसिद्ध दामोदर नदी बोकारो एवं राउरकेला इस्पात संयंत्र, बंगाल पेपर मिल्स एवं सिंदरी उर्वरक कारखाने के अपशिष्ट पदार्थों का संवहन करने के कारण प्रदूषित हो गई है। 'राजनिघंटु' के अनुसार 'रुचिदं संतापशोषापहं पश्यं बह्निकरं तथा च बलदं क्षीणाडंग पुष्टिप्रदम्' गुणयुक्त महानद शोणभद्र की स्थिति बिहार में दामोदर नदी से भी बदतर है। यही स्थिति पश्चिम बंगाल की हुगली नदी, तमिलनाडु की कावेरी नदी, केरल की चालियार नदी, महाराष्ट्र की थानेक्रीक नदी, ओड़िशा की राकुल्या नदी एवं उत्तर प्रदेश की सई आदि नदियों की है। यही नहीं गंगा, यमुना, चर्मण्यवती, नर्मदा, महानदी, कृष्णा, कावेरी, वैगे प्रभृति पवित्र नदियों का भी यही हाल है। वस्तुतः प्राकृतिक संसाधनों का अधिकाधिक दोहन करने में मनुष्य प्राचीन ऋषियों के आदेश एवं सत्परामर्श को भूल बैठा है, जिसके कारण उसे ऐसी भयावह परिस्थितियों का सामना करना पड़ रहा है।

यद्यपि जल-प्रदूषण की गंभीर समस्या से मुक्ति प्राप्त करने के उद्देश्य से केंद्र सरकार ने 1947 ई. में 'जल प्रदूषण रोकथाम एवं नियंत्रण अधिनियम' पारित किया तथा 1985 ई. में 'केंद्रीय गंगा प्राधिकरण' का गठन किया, तथापि इसे किसी स्थाई निदान की अपेक्षा नहीं की जा सकती, क्योंकि स्वात्मानुशासन की प्रेरणा से ही जल-प्रदूषण जैसी गंभीर समस्या का निदान हो सकता है।

मानवीय गतिविधियों के फलस्वरूप विश्व में चतुर्दिक पारिस्थितिकीय असंतुलन से पर्यावरण-प्रदूषण स्तर में वृद्धि और प्राकृतिक खाद्य-श्रृंखलाओं के ध्वस्त होने का सिलसिला चल पड़ा है। वनस्पति के लुप्त होने से उस पर आश्रित जीव-जंतुओं की प्रजातियां भी विलुप्त होती जा रही हैं।मनुष्य प्रकृति के साथ अनेक वर्षों से छेड़छाड़ कर रहा हैं, जिससे पर्यावरण को काफी नुकसान हो रहा हैं। इसे देखने के लिए हमें ज्यादा दूर जाने की जरूरत नहीं है। धरती पर बढ़ रही बंजर भूमि, फैलते रेगिस्तान, जंगलों का विनाश, लुप्त होते पेड़-पौधे और जीव जंतु, दूषित होता पानी, शहरों में प्रदूषित हवा और हर साल बढ़ते बाढ़ एवं सूखा, ग्लोबल वार्मिंग, वैश्विक तापमान वृद्धि, ग्लेशियर पिघलना, ओजोन का क्षतिग्रस्त होना आदि इस बात का सबूत हैं कि, हम धरती और पर्यावरण की सही तरीकें से देखभाल नहीं कर रहें।पर्यावरण प्रदूषण के संदर्भ में भगवान महावराह द्वारा हिरण्याक्ष-वध एवं वसुमत्योद्धार-कथा में अंतर्निहित प्रतीकों का निर्विवाद महत्व है। हिरण्याक्ष कोई राक्षस नहीं, अपितु सोने की आंखवाला धनलोलुप मनुष्य है, जो निजी स्वार्थ के वशीभूत होकर पृथ्वी को प्रदूषित कर रहा है। अंततः प्रदूषित पृथ्वी को भगवान महावराह द्वारा ही मुक्ति प्राप्त हो सकती है। इसमें किंचित् संदेह नहीं-

जलौघमग्ना सचराचराधरा
विषाणकोट्याऽखिल विश्वमूर्तिना।
समुद्धृता येन वराहरूपिणा
स मे स्वयं भूगर्भवान् प्रसीदतु।

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21.https://paryavarankumbh.in/projects/पर्यावरण संरक्षण : संवैधानिक दायित्व

22.https://pib.gov.in/newsite/भारत के संवैधानिक ढांचे के अंतर्गत पर्यावरण संरक्षण

23.http://hi.encyclopediaofjainism.com/जैन वाङ्मय में पर्यावरण चेतना

24.manavabharatilive.com/पुराणों में पर्यावरण

25.http://www.inquireindia.com/गीता में भी है पर्यावरण की चिंता

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An Empirical Study of E-Commerce and its Significant Impact in Business Industries

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ABSTRACT

In this research article the researcher emphasized that significant role and impact of E-commerce in Business Industries. The researcher focused on analysis of significant factors of E-commerce, positive and genitive impact of E-commerce, and challenges of E-Commerce in Business Industries. The researcher defines the dimension of E-commerce with respect to business to business (B2B) and business to consumer (B2C) towards the changing way of doing business on the web in Business Industries. The main objectives of this research article is to focus on the primary route by which e-commerce will affect the economy at large is through its impact on productivity and inflation. Businesses and consumers that use E-commerce benefit from a reduction in costs in terms of the time and effort required to search for goods and services and to complete transactions of business activities which are carried out electronically on the Internet rather than at a physical location.

Keywords : E-commerce, B2B, B2C, Business Industries

I. INTRODUCTION

E-commerce businesses are fast gaining grounds and changing the way of merchants doing business. The main aspect of E-commerce involves doing business on the web and includes [1]:

1. Business to business (B2B) trading which involves a business such as a company trading with another business on the World Wide Web.
2. Business to consumer (B2C) trading which involves a business such as a company directly dealing with consumers over the World Wide Web.

Through websites and portal, some businesses do business with other businesses, an e-commerce model known as B2B. Other businesses sell to consumers online, in a B2C e-commerce model. E-commerce has made it easier for businesses to reach a much wider audience at much lesser expense than what a traditional retail operation will require. With an E-commerce setup, there is no requirement to acquire expensive shopfront in prime areas or for that matter any physical area. A merchant can also produce or store his goods at a remote, cheaper storage location and while being able to market and sell it worldwide. While the cost of developing a good website may be substantial, it is still much cheaper than renting or buying expensive storefronts in the 'high street' by comparison. Additionally, once the merchant website is operational, it can potentially reach a wide client base. The merchant will then have to focus on cost effective product order fulfilment and timely delivery [2] [3].

Why E-Commerce?

Traditional retail companies that have made significant investments in developing physical retail infrastructures are suddenly finding themselves being

outran by smaller e-commerce startups with much lesser physical infrastructure. These E-commerce based startups typically ship order goods out via overseas suppliers who produce high-quality goods at lower cost. This gives the startups an advantage over vertically integrated companies that have traditionally sought to do everything from production to supply. It should be noted that these monolithic companies understandably can't be the best in everything; instead, a company may be good in one aspect and another in a different aspect. The traditional companies are therefore being forced to focus only on what they can do best and outsource the rest if they want to compete favorably [4] [5].

The E-commerce model has contradicted the classic economic theory of decreasing returns scale which holds that a business cannot grow its profits infinitely due to physical expansion considerations. E-commerce based enterprises have been shown to be able sustain fast growth while increasing returns as well. The reason is that these startups have minimal infrastructure and inventory and instead leverage on information and communication [5]. In fact, industries dealing in information based product, can literally bring the cost per unit distribution and sale to zero via E-commerce [6].

E-commerce has radically changed the way people make purchase decisions. With changes in the purchase habits, it's only right that advertising tactics also vary accordingly. Today, even consumers who shop traditionally at a brick and mortar store, look up products information online, read other users' reviews and compare prices before they make the decision to purchase. Businesses today no longer can depend on traditional marketing techniques alone [8]. The researcher must consider digital marketing (including mobile) to meet the demands of the tech-savvy consumers of today. Search engine optimization, paid ads, email marketing, social media engagements are some of the tactics that business owners employ to reach out to millions of potential customers online [9].

II. RELATED WORK

Behshid Behkamal et.al.,(2006) proposed a comprehensive investigation of effective factors on success of B2B electronic commerce that are under control of SMEs themselves These variables include individual features of companies and environment have no influence on them. In this paper basic components are divided into four primary gatherings; business infrastructure, HR, client interface and technical infrastructure. Additionally in our methodology, factors were viewed from SMEs viewpoints [1].Vinamra Nayak, Nitin Jain(2012) emphasized on Use of e-commerce arrangements will help enterprises to expand their business through broader item exposure, better customer service, accurate order entry processes and faster item fulfillment [2].

Sokolov Mladenović, S., and Ćuzović, Đorđe. (2016). Focused on development of e-commerce has influenced its implementation in the travel industry where it is observed like an instrument for improving the efficiency of business activities. However [3]. Niranjanamurthy M, ,Dr. Dharmendra Chadha(2012) emphasized that the increase of the demand, flexibility and power of wireless deals provides proper opportunities for ascending services to customers. Indeed, this could mean the real services giving in all times. In the current Business associations, mobile commerce or M-Commerce has been entered in finance, services, retails, and telecommunication and data technology services. In these sectors, M-Commerce isn't just being widely accepted yet additionally it is being more used as a prominent method for business/commerce [4].

Lipsa Sadath (2013) emphasized that information is considered as an essential type of data that needs collection, management, mining and interpretation to create knowledge. Modern e-commerce is likewise enthusiastically developing that makes resources and services on the internet lavishly bright. Businesses targeting customers has a direct connect with the economy of a nation as the current e-commerce system is used by people from layman to business tycoons [5]

Dr. Singh Sohan, Prof. (Dr.) Sharma R. K.(2010) stated that internet has brought to the universe of business e-commerce and it refers to use of computer networks for purchasing and selling merchandise, data and services. It integrates E-Mail, Electronic Fund Transfer (EFT), Electronic Data Interchange (EDI) and comparative techniques into a comprehensive electronic system of exchanging. E-commerce combines IT, Telecommunication technology and business process to make it feasible to work together in manners that couldn't be even idea of earlier. It opens up new avenues of exchanging and improves efficiency and effectiveness of conventional business processes, markets and services [6].

Sameeah Alvi (2016) focused on M-commerce is the subsequent generation of e-commerce which facilitates the user to access internet without requiring a place for module. Today, mobile isn't merely used for sending messages or for calling however it serves a wide variety of other purposes that are beneficial in corporate world. M-commerce helps in improving relationship with customers. It is an area that is still under development phase and offers potential prospects for further research and applications. Since the subject is at the stage of progress, this research help explore how and why m-commerce is increasing consistent prevalence and assuming control over e-commerce and initiates further research on the reasons of development of m-commerce expertise. Earlier studies suggest that e-commerce and m-commerce are not just leading edge for doing worldwide business and trade yet in addition offers multiple benefits to the business, government and consumers on generous scale. [7].

María de la Soledad Zapata Agüera (2009) focused on utilizing computerized channels that enables you to transcend customary requirements such a geography and time zones to connect with an a lot wider audience. For this creator, e-marketing is significant because the market is worldwide and wider, and it is necessary to be able to reach a segment with precision utilizing the computerized marketing that gives us this choice [8].

Vera Pujani, Refdinal Nazir (2019) emphasized those E-commerce applications that play in different stages of the environmental effect especially energy utilizations. The internet technology and electronic commerce (e-commerce) which drastically changed the trend of data system (IS) applications in business to be internetworked e-business will be reviewed. The commitment of e-commerce on business has been identified as one of success variables to pick up companies targets. In line with data technology development, e-commerce is likewise more used by business associations around the globe. The use of e-commerce has the effect on environmental effects in terms of energy utilizations [9].

Amol Kale, Rajivkumar Mente (2018) identifies the services and utilizations of M-commerce. In Mobile Commerce purchasing and selling of merchandise and ventures utilizing mobiles which are wireless handled device. Mobile commerce is the next generation of E-commerce which enable costumer to access internet from anywhere. Current days, mobile are not use just for sending test message or calling however it likewise used for other facilities, for example, web perusing. This network technology used in M-commerce based on wireless application convention. It helps in improving relationship with customer [10].

Dr. Shahid Amin Bhat (2016) stated that E-commerce is a blast in the modern business which defines E-commerce means electronic commerce. E-commerce (Electronic commerce) involves purchasing and selling of merchandise and enterprises, or the transmitting of assets or information, over an electronic network, predominantly the Internet. E-commerce (Electronic commerce) is a change in outlook influencing the two marketers and the customers [11].

Dr Kishore Kumar Das (2015) emphasized that factors that are fuelling development in E-Commerce sector in Business World. The methodology of my examination is from secondary sources, for example, articles, diaries, reports, papers ,sites and conference proceeding . E-Commerce one of the highest developing business, with India having great market potential for investments. There has been huge surge in investment since a year ago and more is expected in coming years. The fast development being used of mobile and internet users has facilitated E-Commerce business in both urban and country cities [12].

Rajneesh Shahjee (2019) focused on investigation of the effect of Electronic Commerce on Business. The research study has highlighted the Management Information Systems, Finance and Accounting, Marketing and Computer Sciences of E-Commerce on Business. E-commerce is a method for leading business over the Internet. In spite of the fact that it is a relatively new concept, it can possibly alter the conventional type of economic activities [13].

Dr. Rajasekar S. also, Sweta Agarwal (2016) stated that E-commerce involves an online exchange. E-commerce provides multiple benefits to the consumers in type of accessibility of merchandise at lower cost, wider choice and saves time. The general category of E-Commerce can be broken down into two sections: E-Merchandise and E-finance. Numerous companies, associations, and communities in India are working together utilizing E-commerce and furthermore are receiving M-commerce for working together [14].

Anuj et.al. (2018) emphasized that the importance of E-Commerce in Indian economy. It is very much imperative to have government intervention and huge investment inflow in type of foreign direct investment in large economy like India to stabilize and increase the development of E-Commerce industry in the economy. In this paper the researcher will look towards the role of government in E-Commerce industry and furthermore look towards the different barriers of e commerce in Indian aspects. "In this research paper the researcher discussed for the most part about B2C E-Commerce and its percentage of total national output in Indian economy [15].

Shahriari et.al. (2015) emphasized that many economists and experts believe that in recent years, a revolution has occurred like the mechanical revolution which the world has entered the data age. It makes large changes in the economic, social and social aspects. One aspect of this change is changes in economic relations between people, companies and governments. Commercial exchange between people who had been based on paper documents to exchanges of by us the systems based on electronic data. In this article the researcher examined the benefits of e-commerce and its effect on the market [16].

Rajendra Madhukar Sarode (2019) emphasized that E-commerce is one of the business alternatives that one should explore in the future. E-Commerce is said to achieve change in perspective on the planet for exchanging. Prediction e-commerce is indicating tremendous business development in our nation. Backed by increased online user base and mobile phone presentation, Indian e-commerce has seen impressive development over the most recent couple of years. Considering India's demographic dividend

and rising internet accessibility, the sector is slated to scale greater heights [17].

Madhurima Khosla, Harish Kumar (2017) stated that E-commerce is one of the fastest developing segments to encourage and support the development of E-Commerce. The survival of the e-commerce firms in a profoundly unique environment becomes a challenging errand when coupled with the relentless competition prevailing in the sector [18].

III. OBJECTIVES OF THE STUDY

The researcher stated that E- commerce is playing one of the significant role in business Industries to control the business activities and transaction with rapid and convenient way in between business to business (B2 B) and business to consumer (B2C). In this research article the researcher focused on some of the significant research issues:

1. Analysis the factors of E-commerce which are significant in Business Industries.
2. Analysis the positive and negative impact of E-Commerce in Business Industries.
3. To study the challenges of E- commerce in Business Industries.

IV. RESEARCH METHODOLOGY

This research paper has been written on the basis of secondary data. The secondary data were collected from published books, journals, research papers, magazines, daily newspaper, internet and official statistical documents. The study is qualitative in nature.

V. SIGNIFICANT IMPACT OF E-COMMERCE IN BUSINESS INDUSTRIES

The researcher emphasized that E-commerce offers businesses a vital opportunity to offer their customers round-the-clock convenience [11]. A good E-Commerce strategy that adds excellent customer service and a dynamic social media presence into the mix can spell higher traffic and better sales for your business. E-commerce and the never-ending array of virtual companies are today challenging long-accepted economic practices and creating hyper-competition like never before. While globalization and the internet open up newer markets for you to reach out to, it brings you a hoard of competitors who are all waiting to steal your market share[12].In this era of digitalization and online shopping, businesses that don't jump on the e-commerce bandwagon are bound to get lost in the melee. That doesn't mean you have to reach out to the first E-commerce website design services you come across to design an online shopping portal for your company[14][15].

1. Return on Intangibles: Traditionally, while intangible assets helped businesses remain competitive in their field, other physical assets like building, equipment, IT infrastructure, proper management (HR), and customer relations helped companies to gain an edge over their competitors. With the growth in the internet and widespread availability of E-commerce, today businesses are able to make profits out of their intangible assets. Today, collaboration and communications between suppliers and vendors is easier and cost next to nothing. This means businesses can now leverage their intangible assets to a broader market. E-Commerce has removed all time and space constraints that businesses faced just a few years ago. Companies no longer have to work in a particular geographical location or time zone.

2. Low Cost of Initial Business Setup: Just a few decades back, to set up a business, one will require massive capital costs. However, E-commerce changed all this. Today, thanks to the internet, it is completely possible to set up a global company 'out of one's garage' with minimal investments.

3. Bigger Market Exposure: Traditionally, small business owners who specialized in a particular niche were restricted to very specific markets. Even though

their niche was customized and distinct, they couldn't make higher profits due to the inability to reach out to bigger markets.

4. Elimination of Middlemen: Today, businesses can directly sell to customers without the need for any intermediaries or middlemen. For example, a local fabric merchant who previously have to depend on a network of vendors and brokers to distribute his / her fabrics to selected geographical locations can now expand beyond his / her confined vicinity by himself / herself.

5. Businesses are now Open 24 x 7: In the world of E-commerce there is no downtime. Businesses are opened for 24 x 7, 365 days of the year. And, sales can happen at any time of the day, every day. Traditionally, businesses had to close shop at the end of the day, in whichever location they are in. This means shoppers were restricted and had to complete their purchases within a particular time.

6. The Size of the Company No longer Matters: Whether we run your online business solo-handed or with the help of a hundred-member team, it makes no difference to the end consumer. This means as mentioned before, a small business owner can compete on a level playing field with the large players in the market.

Traditionally, small business owners faced major drawbacks due to their lack of staff. They couldn't match the customer service provided by massive brick and mortar stores. Today, the situation has altered. The positives of running a small business far outweigh big, clunky corporations in the online world, thanks to AI chat bots and various E-commerce automations [17].

IV. POSITIVE AND NEGATIVE IMPACT OF E-COMMERECE IN BUSINESS INDUSTRIES

Since E-commerce is a business activity carried out electronically on the Internet rather than at a physical location, comes with its own set of challenges. The advent of e-commerce has brought about both positive and negative effects.

1. **Lost of Privacy:** Retailers with an e-commerce presence can collect a lot of information about visitors to their websites. By setting up electronic trackers in the buyers' browser cache called cookies that track the surfing patterns of visitors, e-commerce merchants can collect the shopping profiles and preference of their online customers. This allows the former to target advertisements to the latter based on what is relevant and recent. While it may be used to enhance shoppers' shopping experience, some critics argues that this activity intrudes on consumers' privacy.

2. **Security Threats:** While offering convenience to both sellers and buyers, the negative effect of e-commerce is its potential threat to the security of consumers' personal information. When consumers buy online, they typically input their credit card number and other personal information. Hackers can access this information through security flaws in the merchant's computer system. Merchants have since become much more vigilant about information security than they were in the early days of e-commerce.

3. **Reduced Carbon Footprint:** One positive effect of the emergence of e-commerce is that it may save energy. Consumers who shop online rather than drive to stores use lesser fuel and their cars emit less pollution. Also, because e-commerce reduces the need for warehouse space to house goods near retail stores, these warehouses use less energy. On the flip side, the usage of electricity has

increase to house data servers as well has power the millions of computers used in the transaction.

4. **Cost Reduction:** E-commerce can reduce costs for consumers when companies cut down on middlemen involved in distributing goods, warehouse space to store the goods and personnel overheads. E-commerce also enables companies to manage their inventory better through connected management systems. To be competitive, businesses are likely to pass down at least some of these savings to consumers.

5. **Lower Profit Margins**: With the information efficiency comes transparency of price. Merchant can no longer mark up their profits excessively for the reasons the buyer has many other choices with lower prices. The seller will need to constantly compete for higher positive user ratings and greater volume to make the same amount of profits.

V. CHALLENGES OF E-COMMERCE IN BUSINESS INDUSTRIES

Any E-Commerce businessperson knows very well, the level of competition for E-commerce customers has likewise never been higher. As indicated by numerous industry experts, there are at any rate four dimensions to the challenges confronting E-Commerce in the present crowded online marketplace. The real challenges of E-commerce include:

1. **Economic Challenges:** The economic challenges confronting E-Commerce merchants include the costs related to establishing an E-commerce business, the number of competing online merchants, issues connected with infrastructure upgrades, and the accessibility (or shortage) of skilled staff. It is estimated up to 90 percent of the Internet have are from the high-income countries which make up just about 16 percent of the world's population. The opportunity and also challenge is how to bridge the larger parts of the physical world who are not tech savvy or ready to embrace the Internet, let alone e-commerce.

2. **Technological Challenges:** As indicated by industry observers, the essential technology-related challenges confronting E-commerce businesses include security concerns, transfer speed accessibility, and integration with existing conventions. Integrating Internet software with existing applications and databases presents an ongoing technology challenge. Another challenge resulting from increased E-commerce activity is constantly developing the reliability of network infrastructure to cope with the growing usage demand.

3. **Security:** One of the realities of the explosive prevalence of E-commerce is that it has become an attractive target for digital hoodlums; cyber cheating; cyber scams. With each new prominent 'hacking' incident, consumer confidence in online retailing takes a 'hit' which further raises the awareness and concerns of E-commerce security. E-Commerce technology is constantly evolving and integrating that new security measures is by no means an easy or inexpensive endeavor.

4. **Social Challenges:** In recent years, consumers' concern over issues, for personal data protection, and the sharing of personal data has escalated exponentially. Furthermore, there are social differences that has come into play when growing an E-commerce business beyond its

native region. Unlike conventional merchants who were easily able to use their familiar language and marketing methods that went well with their targeted local audience, online sellers now have to take into consideration the numerous semantic, social and social differences in their extended customer base. Any of those differences can possibly create hindrances for E-commerce companies in their efforts to develop long haul 'relationships' with an expansive customer base.

5. **Legal Challenges:** In spite of the fact that it might seem just as E-commerce has been in existence for a very prolonged stretch of time, the reality is that it is still at its infancy with numerous unresolved legal issues, including those pertaining to intellectual and technological property rights. Then there are legal issues pertaining to tax assessment: as noted in our previous cites and covered extensively in business media in recent months. For example, the recent Supreme Court's decision enabling various states to impose online sales taxes on businesses that are not physically located inside their boundaries can possibly drastically affect the profitability of E-commerce companies nationwide. The decision to charge nonresident E-commerce operators is a setback to one of the prime drivers of E-Commerce for their phenomenal success; which is the ability to earn globally without being restrained by the local taxation laws, leading a huge drawback for E-commerce companies to increasing market share in some countries.

VI. CHALLENGES FACING E-COMMERCE

A recent analysis of the E-commerce identified several trends that will likely help to shape the future of online sales. Some of the most significant ecommerce trends shaping its future include [12] [13]:

1. **Online to Offline Growth:** Despite explosive growth in recent years, E-commerce still represents only about 11.9 percent of retail sales, although that is up from only 3.5 percent a decade ago. As a result, "online to offline" commerce is a trend to watch, as merchants strive to provide "shoppers with a digital experience that can match a distinctive in-store feel."
2. **Multi-Channel E-commerce:** Mobile customers are expected to account for $319 billion in sales by 2020, and "multi-channel" sales, providing customers the ability to easily purchase goods through an array of avenues, will become ever-more important in the years ahead, going forward, successful online merchants will need to have an infrastructure that manages and maintains a seamless multi-channel retailing experience.
3. **E-commerce Automation:** As technology continues to evolve, so do the operational needs of online merchants. In addition to fulfillment automation in the warehouse, ensuring that a business' website is fully up-to-date with the latest technology, requiring minimal human involvement on a daily basis, will be vital to continued success for e-commerce companies.
4. **Mobile E-commerce's Growing Popularity:** According to data from Adobe, in 2017 on both Black Friday and Cyber Monday of that year, 30 percent of online sales closed through mobile devices. Although desktop is still far more popular for making ecommerce purchases, mobile is growing in popularity and should no longer be seen as just a method of allowing online customers to 'browse and buy'. The challenge would be how to push the envelope of presenting the most intuitive and engaging experience in a 6-inch screen real estate.
5. **Opportunities in International E-commerce:** The study found that 1.4 billion people will join the

global 'middle class' by 2020, with 85 percent of that growth in the Asia Pacific region. Establishing local partnerships, familiarizing oneself with regional laws and customs, and ensuring strong, effective marketing will all be key elements to consider as ecommerce companies consider expanding into the global e-commerce market.

Although we are still less than two decades into the new century, many E-commerce merchants are already facing the challenges of 'growing pains'—moving beyond their start-up phase, and trying to optimize the opportunities that come with growth and business maturation.

VII. CONCLUSION

In this research paper, the researcher emphasized that E-commerce has rapidly changed the way in which businesses operate. The researcher also stated the significant impact of E-commerce in Business Industries with respect to business-to-business (B2B) and business-to-consumer (B2C) are the technology enabled innovations like digital payments, hyper-local logistics, analytics driven customer engagement and digital advertisements will likely support the growth in the sector. The growth in E-commerce has a significant impact on business Industries towards boost employment, increase revenues from export, increase tax collection by ex-chequers, and provided better products and services to customers intelligently using collected big data. Finally the researcher concluded that E-commerce has grown rapidly and changed significantly over the years, as such there is plenty of various factors for buyers, investors and entrepreneurs to be mindful of. The researcher analyzed the significant drivers which are directly related to E-commerce and its usage in business Industries and also stated that positive, negative impact in the business Industries.

VIII. REFERENCES

[1]. Behshid Behkamal, Mohammad Kazem Akbari, Mohsen Kahani (2006).Critical Success Factors For Success Of,B2b Electronic Commerce In SMES,IADIS International Conference e-Commerce 2006, Information Technology at Amirkabir University of Technology.

[2]. Vinamra Nayak, Nitin Jain(2012).Proceedings of the Second International Conference on Soft Computing for Problem Solving (SocProS 2012), December 28-30, 2012 pp 507-517.

[3]. Sokolov Mladenović, S., and Ćuzović, Đorđe. (2016). the Role of E-Commerce in Tourism Development of the Republic of Serbia. TISC - Tourism International Scientific Conference Vrnjačka Banja, 1(2), 518-535.

[4]. Niranjanamurthy M, Dr. Dharmendra Chahar (2012). E-Commerce and M-Commerce: Issues and Recommended Screening, International Journal of Marketing and Technology, IJMT Volume 2, Issue 8 ISSN: 2249-1058

[5]. Lipsa Sadath (2013).Data Mining in E-Commerce: A CRM Platform, International Journal of Computer Applications (0975 – 8887), Volume 68–No.24, April 2013.

[6]. Dr. Singh Sohan, Prof. (Dr.) Sharma R. K.(2010). Business research in e-commerce: challenges and strategy, Mangalmay Journal of Management and Technology, Year: 2010, Volume: 4, Issue: 2, Print ISSN: 0973-7251. Online ISSN: 2230-729X.

[7]. Sameeah Alvi (2016).Running Head: Intention to Adopt M-Commerce over E-Commerce, KASBIT Business Journal (KBJ) Vol. 9, 154-175, December, 2016.

[8]. María de la Soledad Zapata Agüera (2009). Understanding E-Marketing Strategies,

Handbook of Research on Entrepreneurship and Marketing for Global Reach in the Digital Economy, 2019 |Pages: 35 , DOI: 10.4018/978-1-5225-6307-5.ch017.

[9]. Vera Pujani, Refdinal Nazir (2019).E-Commerce Impacts on Energy Consumptions: A Conceptual Framework: Management Department, Andalas University

[10]. Amol Kale, Rajivkumar Mente(2018).M-Commerce: Services and applications, International Journal of Advanced Science and Research, Volume 3; Special Issue 1; March 2018; Page No. 19-21, ISSN: 2455-4227.

[11]. Dr. Shahid Amin Bhat (2016).A Review Paper on E-Commerce, TIMS 2016-International Conference, At Gwalior, February 2016,ITM University Gwalior.

[12]. Growth of E-Commerce in India, International Journal Of Core Engineering and Management (IJCEM) Volume 2, Issue 4, July 2015 25, ISSN: 2348 9510.

[13]. Rajneesh Shahjee(2019).The Impact Of Electronic Commerce On Business Organization, Scholarly diary for interdisciplinary research, ISSN:2278-8808

[14]. Dr. Rajasekar S. also, Sweta Agarwal (2016).A Study on Impact of E-Commerce on India's Commerce, International Journal of Development Research Vol. 6, Issue, 03, pp. 7253-7256, March, 2016.

[15]. Anuj, Fahad Fayaz, Ms Namita Kapoor (2018).Impact of E-Commerce in Indian Economy, IOSR Journal of Business and Management (IOSR-JBM) e-ISSN: 2278-487X, p-ISSN: 2319-7668. Volume 20, Issue 5. Ver. VI. (May. 2018), PP 59-71.

[16]. Shahrzad Shahriar, Mohammadreza Shahriari, Saeid gheiji(2015).E-Commerce and It Impacts On Global Trend and Market, University College of Commerce &Business Management Osmania University, Hyderabad, Vol.3(Iss.4):April,2015] ISSN-2350-0530(O) ISSN-2394-3629(P).

[17]. Rajendra Madhukar Sarode (2019).Future of E-Commerce in India Challenges and Opportunities, International diary of applied research, ISSN Print: 2394-7500 ISSN Online: 2394-586.

[18]. Madhurima Khosla, Harish Kumar (2017).Growth of E-commerce in India: An Analytical Review of Literature, IOSR Journal of Business and Management (IOSR-JBM), Volume 19, Issue 6. Ver. I (June 2017), PP 91-95, e-ISSN: 2278-487X, p-ISSN: 2319-7668.

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वैदिक वाड्मय में महिला अधिकार

विपुल शिव सागर
शोधछात्र संस्कृत(जेआरएफ)
नानक चंद एंगलो संस्कृत कॉलेज
संबद्ध चौधरी चरण सिंह विश्वविद्यालय
मेरठ

महिला शब्द मह+इलच्+आ महिला से मिलकर बना है। मह का अर्थ श्रेष्ठ या पूजा है। अर्थात् जो श्रेष्ठ होती है वही महिला कहलाती है। लौकिक संस्कृति में आदर देने के लिए स्त्रियों के लिए मान्य शब्द का प्रयोग किया जाता है। यह वस्तुतः मेना शब्द से बना है। जो नारी अर्थ का वाचक है। यास्क कृत निरूक्त (3./21/2) में इसकी व्युत्पत्ति इस प्रकार की गई हैं

मानयन्ति एनाः' (पुरूष)
स्त्री अर्थ का एक अन्य बोधक 'ग्ना शब्द भी ऋग्वेद में आया हैं, जो देव पत्नियों के लिए प्रयुक्त होता है। ब्राह्मण ग्रन्थों में यही शब्द मानवी के लिए प्रयुक्त है। यास्क ने इसकी व्याख्या की हैं– **''ग्ना गच्छन्ति एनाः''।** पुरूष ही उसके पास जाते हैं, सम्मानपूर्वक बात करते हैं। उसे पुरूष से अनुनय की आवश्यकता नहीं पड़ती।

भाष्यकार महर्षि पतंजलि के अनुसार **''स्त्यास्यति अस्याँ गर्भ इति स्त्री''**। उसके भीतर गर्भ की स्थिति होने से उसे स्त्री कहा गया है।

नारी शब्द नर की ही तरह नृ धातु से बना है और इसका सामान्य अर्थ है क्रियाशील रहने के कारण ही नारी हुई। जो गति करे, हलचल करे वह नर एवं नारी। किन्तु ऋग्वेद में नृ का प्रयोग नेतृत्व करने, दान देने और वीरता करने के अर्थ में किया गया है। वेंदों में तो नारी के गौरव का अनेक प्रकार से वर्णन है। एक स्थान पर नारी को ब्राह्मण कहा गया है। **''स्त्री हि ब्रह्मा बभूविथ'' (ऋग्वेद** 8133/19) इसका अभिप्राय यह है कि वह स्वयं विदुषी होते हुए अपनी संतान सुशिक्षित बनाती है। जिस प्रकार ब्रह्म ज्ञान का अधिवक्ता यज्ञ का संचालन कर्ता, तथा ज्ञान विज्ञान में सर्वोत्कृष्ठ होने के कारण सर्वोच्च माना जाता है, उसी प्रकार नारी पर में सम्पूर्ण कार्यों के निर्वाहन, पुत्रादि का पालन पोषण करने के कारण ब्रहम कहा गया है।

ऋग्वेद के दशम् मण्डल के 109 उक्त में शची वर्णन आता है। वह कहती हैं – अहं केतुरहं **मूर्धामुग्रा** विवचिनी। ममेदनु क्रतुँ पतिः सेहनाया उपाचरेत्।। 10/59/2 अर्थात् – मैं ज्ञान में अग्रगण्य हूँ। मैं उच्चकोटि की वक्ता हूँ। मुझ विजयिनी की इच्छानुसार ही मेरा पति आचरण करता है।

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वेदों में नारी को ही घर कहा गया है।

जायेदस्तं मधवन्त्सेदु योनि स्तदित्वा हरयो युक्ता वहन्तु।। ऋग्वेद 3/53/4
अर्थात् घर, घर नहीं है। अपितु गृहिणी ही गृह है। गृहिणी के द्वारा ही गृह का अस्तित्व है। यही भाव एक संस्कृत सुभाषित में कहा गया है कि गृहिणी ही घर हैं ''न गृहं गृहमित्याहुः गृहिणी गहमुच्यते''।

स्त्री को सरस्वती का रूप मानते हुए अथर्ववेद में कहते है कि–
प्रतिष्ठा विराडसि, विष्णुरिवेह सरस्वति। सिनीवालि प्र जायताँ, भगस्य सुमतावसत्।। अथर्ववेद–14/2/115
हे नारी/ तुम यहाँ प्रतिष्ठित हो। तुम तेजस्विनी हो। हे सरस्वती! तुम यहाँ विष्णु के तुल्य प्रतिष्ठित होना। हे सौभाग्यती नारी! तुम सन्तान को जन्म देना और सौभाग्य देवता की कृपा दृष्टि में रहना।
स्त्री की प्रतिष्ठा अपने गुणों और योग्यता के आधार पर ही है।

स्वैर्दक्षेर्दक्षपितेह सीद, देवाना सुम्ने बृहते रणाय। यजु 14/3
हे नारी! तुम यहाँ प्रतिष्ठित हो। तुम तेजस्विनी हो। हे सरस्वती ! तुम यहाँ विष्णु के तुल्य प्रतिष्ठित होना। हे सौभाग्यवती नारी! तुम सन्तान को जन्म देना और सौभाग्य देवता की कृपा दृष्टि में रहना।
स्त्री की प्रतिष्ठा अपने गुणों और योग्यता के आधार पर ही है।

स्वैर्दक्षेक्षपितेह सीद, देवाना सुम्ने बृहते रणाय। यजु। 14/3
हे नारी ! तुम अपनी योग्यता से ज्ञान का कोश होकर, देवों के कल्याण तथा महान आनन्द के लिए इस घर में रहो।
वेदों की ही तरह ब्राह्मण ग्रन्थों में भी नारी का गौरव वर्णित है। यहाँ नारी को सवित्री कहा गया है–

''स्त्री सावित्री''। जैमिनीय उप. ब्रा. 25/10/17
तैत्तिरीय ब्राह्मण में नारी को आत्मा का अर्द्धभागकहा गया है।

अर्धो वा एष आत्मनः यत पत्नी।
तैतिरीय ब्राह्मण में ही कहा गया है कि–
नारी के बिना यज्ञ अपूर्ण है। नारी के बिना सप्तनीक यज्ञ करें। तैत्ति. ब्रा. 3/3/3/5

अयज्ञों वा एषः योप्त्नीकः। तैत्ति. ब्रा. 2/2/2/6
शतपथ ब्राह्मण में उल्लेखित है कि– **यावत जयाँ न विन्दते, असर्वो हि तावद् भवति। शतपथ ब्रा. 5.2.1. 10.** अर्थात् पत्नी के बिना जीवन अधूरा है। इसी प्रकार ऐतरेय ब्राह्यण का वाक्य है।
जाया गार्हपत्यः (अग्निः) ऐत. ब्रा. 8.24– पत्नी गार्हपत्य अग्नि हैं। शतपथ ब्राह्यण में स्त्री के अपमान को निन्दीय का माना गया है–

न वै स्त्रिंय हनन्ति। शत. शत.ब्रा. 11.4.3.2
तैत्तिरीय ब्राह्मण के मतानुसार **श्रिया वाएतद् रूप्यं यत् पत्नयः। 3/9/4/7** उपनिष्द्कारों ने तो नर और नारी में भेद तत्व को स्वीकार नहीं किया। एक ही तत्व से उत्पन्न तथा एक ही चेतना की छाया रूप को स्वीकार करते हैं।

ये सर्वेषु भूतेषु तिष्ठन्सर्वेभ्यो भूतेभ्योन्तरोा यं सर्वणि भूतानि न विदुर्यस्य सर्वाणि भूतानि शरीरं यः सर्वाणि भूतान्यन्तरों यमयत्येषु न आत्मान्त्याभ्यतमृतः।
वृहदारण्यक उपनिषद् 3/7/15 ये सब भूतों में रहता हुआ भी सबसे पृथक है, जिसे सारे भूत नहीं जानते। सारे भूत जिसका शरीर है, जो सब भूतों में स्थित होकर उनका नियन्त्रण करता है। वह तेरी आत्मा हैं वह सब में व्याप्त है और किसी भी विशेष अविशेष नहीं है।
स्मृतिकारों ने नारी को विशेष सम्मान देने की बात करते हुए कहते है कि

यत्र नार्यस्तु पूज्यन्ते, रमन्ते तत्र देवताः। यत्रैतास्तु न पूज्यन्ते सर्वास्तत्रा फलाः क्रियाः।। मनु 3।56
अर्थात् जहाँ नारियों का सम्मान होता है, वहाँ देवता निवास करते हैं। जहाँ इनका सम्मान नहीं होता, वहाँ प्रगति, उन्नति की सारी क्रियाएं निष्फल हो जाती हैं।
पुनः स्मृतिकार कहते हैं कि–

यदि कुलोन्नयने सरसं मनो, यदि विलासकलासु कुतूहलम्। यदि निजत्वमभीप्सितमकेदा, कुरू सताँ श्रुतशीलवर्ती तदा।।
अर्थात् यदि तुम चाहते हो कि तुम्हारे कुल की उन्नति हो। यदि तुम्हे ललित कलाओं में रूचि है। यदि तुम अपना और अपनी सन्तान का कल्याण करना चाहते हो तो अपनी कन्या को विद्या धर्म और शील से युक्त करो।
पारस्कार गुह्यसूत्र में स्त्रियों की गौरवमयी गाथ इस प्रकार वर्णित किया गया है। **तामद्य गाथाँ गास्यामि ता स्त्रीगाामुक्तमं यश इतिः। पार. गृह्य. 1.7.2।**
वृहत्संहिता पुरूषाणाँ सहस्रं च सती समुद्धेरत।
'' अर्थात् सती स्त्री अपने पति का ही नहीं, अपने उत्कृष्ट आचरण की प्रत्यक्ष प्रेरणा से सहस्रों पुरूषों का उद्धार यानि श्रेष्ठता की दिशा का मार्गदर्शन करती है।
व्यास संहिता में वर्णित है कि– **यायन्त विन्दते जायाँ तावद धोंभवेत पुमान्**
पत्नी की प्रप्तित के पुरूष अधुरा है।

मार्कण्डेय पुराण में सभी स्त्रियों को आदि शक्ति का ही स्वरूप स्वीकार किया गया है।

विद्या समस्तास्तव देवि भेदाः। स्त्रियः समस्ता सकला जगत्सु।।

अर्थात् समस्त स्त्रियाँ और समस्त विधाएं देवी रूप ही हैं।

श्रीमद्भागवत पुराण के अनुसार वैवस्वत मनु की धर्मपत्नी ने पुत्रेष्टि यज्ञ के अवसर पर कन्या उत्पन्न होने की याचना की थी। **तत्रश्रद्धा मनोः पत्नी होतांर समयाचत्। दुहिर्त्रथमुपागम्य प्रणिपत्य प्रयोवता।। श्रीमद्भागवत् 9।1।14**

इसी से इला की उत्पत्ति हुई।

ब्रह्मवैवर्त पुराण में राजा कुशध्वज की पत्नी मालावती से उत्पन्न वेदवती नामक कन्या का वर्णन है जो बाल्यकाल से ही वेदों के उच्चारण में कुशल थी–

वेदध्वनिं सा चकार, जातमात्रेण कन्यका। तस्माताँ ते वेदवर्ती प्रवदन्ति मनीषिणः।।
सततं मूर्ति मन्तष्च, वेदाष्च चत्वार एवं च। सन्ति यस्याष्च जिह्वाणे, साच वेदवती स्मृता।। ब्रह्ममैवर्त, प्रकृति अ.14

तंत्र शास्त्र मेंनारी को शिव की शक्ति के रूप में स्वीकार किया गया है। शक्ति आगमतन्त्र के तारा खण्ड में कहा गया है।

नारी त्रैलोक्य जननी, नारी त्रैलोक्य रूपिणी। नारी त्रिभुवनादारा, नारी शक्ति स्वरूपिणी।।
शक्ति आगम तन्त्र, ताराखण्ड शक्ति तंत्रागम में नारी के विषय में पुनः कहते है कि–
न च नारी समं सौख्यं, न च नारी समागति, न च नारी सह्नशं भाग्यं, न च भूतो न भविष्यति।
न च नारी हदृषं राज्यं, न च नारी सह्नशं तपः, न च नारी हदृषं तीर्थ, न भूतं न भविष्यति।
न नारी सदृषों योगो, न नारी सदृषों जपः न नारी सदृषों योगो, न भूतो न भविष्यति।
न नारी सदृषों मन्त्रः न नारी हदृषं तपः न नारी हदृषं वित्तं, न भूतो न भविष्यति। – शक्ति आगम तन्त्र, ताराखण्ड 13.46,48

वैदिक कालीन समाज में नारी को वो सारे अधिकार प्राप्त था। जिसकी वकालत आज के नारीवादी हितैषी किया करते हैं। जैसे–

1. **शिक्षा प्राप्ति का अधिकार।**

   अथर्ववेद में कन्या द्वारा ब्रह्मचर्य आश्रम में शिक्षा प्राप्ति का उल्लेख मिलता है।[5] कौषिकी ब्राह्मण में अनेक विदुषी स्त्रियों का वर्णन प्राप्त होता है।[6] पणिनि ने तो महिला शिक्षण विद्यालयों का उल्लेख किया है। जिसमें शिक्षा ग्रहण केवल महिलाएँ ही किया करती थीं। इसी प्रकार अष्ठाध्यायी पर लिखी काशिकावृत्ति में आचार्या एवं उपाध्याय शब्दों की व्युत्पत्ति प्राप्त होती है।

   छान्न्यादयः शालायाम् – 6/2/86
   काशिका वृत्ति – 4/1/59, 3/21

2. स्वतंत्र रूप से अभिव्यक्ति तथा काव्य सृजन का अधिकार–

अतिकुल की विश्वारा – ऋग्वेद 5/28
अपालासिक्ता निवावरी – ऋग्वेद 8/91
घोषा निवावरी – ऋग्वेद 10/39–40

3. युद्ध में प्रतिभाग लेने का अधिकार

विश्पला नामक स्त्री के युद्ध में घायल होने का उल्लेख ऋग्वेद में मिलता है।[7] महिलाओं को युद्ध क्षेत्र में अपना रण कौशल को दिखाने की पर्याप्त स्वतंत्रता थी। महिलाओं को युद्ध संचालन सेना को नेतृत्व प्रदान करने, रणनीति तैयार करने की पर्याप्त छूट थी। युद्ध के समय नीति निर्धारण में भी परामर्श देती थी तथा पुरूष उसका अनुसरण भी करते थे। इसकी पुष्टि हम रामायण में कैकेयी तथा महाभारत में शिखण्डी के उदाहरण से स्पष्ट होता है।

स्मृतियों में 8 प्रकार के विवादों का उल्लेख मिलता है। प्रत्येक स्त्री को प्राचीन काल में अपने पसंद के अनुसार वर चूनने की स्वतंत्रता थी। स्वयंवर तथा शास्तार्थ के द्वारा नारी अपनी योग्यता के अनुसार वर का चुनाव करती थी। ऋग्वेद में कहा गया है कि–''कन्या सुन्दर एवं आभूषित हो तो वह स्वयं पुरूषों के झुण्ड से अपना वर ढूंढ सकती है।''[8]

पत्नी के रूप में वह गृहस्थ जीवन के सभी धार्मिक कृत्यों को करने की वह अधिकारिणी थी। वह अपने पति के साथ मिलकर धार्मिक कार्यों को सम्पादित करती थी।[9] तैतरीय ब्राह्मण के अनुसार पत्निहीन पुरूष यज्ञ करने का अधिकारी नहीं था।[10] पत्नी को आर्थिक अधिकार भी प्राप्त थे। वह पति की सम्पत्ति में अधिकारिणी होती थी। ऋग्वेद कालीन समय में स्त्री को उसके पति की मृत्यु के उपरान्त विधवा पुर्नविवाह का अधिकार प्राप्त था। पति के शव के पास बैठी शोक विह्वल स्त्री से कहा गया है कि–

उदीर्ष्व नार्याभि जीवलोक गता सुमेतमुप शेष एहि।
हस्तग्रामस्य दिधिषोस्तवेदं पत्युर्जनित्वमभि संवभूथ।।[11]

श्रौत काल में स्त्रियाँ, पुरूषों के समान अनेक कार्यों को करने की अधिकारिणी थी। स्त्री की प्रशासनिक कुशलता को शंखायन ब्राह्मण में इस प्रकार व्यक्त किया गया है–

मृहान् गच्छ मृहपत्नी यथासो वशिनी एवं विदथमा वदासि।

अर्थात् हे सूर्या! तुम श्रेष्ठ गृहिणी बनी और पतिग्रह में निवास करती हुई भृत्यादि पर शासन करो।

आर्थिक रूप से नारी सम्पन्न एवं सामर्थ्यवान थी। उसको सम्पत्ति सम्बधित विविध अधिकार प्राप्त थे। पति के द्वारा विवाह के समय यह शपथ ली जाती थी। कि वह पत्नि के आर्थिक मामलों में हस्तक्षेप नहीं करेगा।

अर्थवेद 10.30.5, 12.3.14 मधुशास्त्री "Status of Hindu Women" से उद्धृत। नारी की सुदृढ़ आर्थिक स्त्रीधन की व्यवस्था थी। विवाह के समय स्त्री को जो उपहार प्राप्त होते थे। उस पर स्त्री का एकाधिकार होता था, इसे ही स्त्रीधन कहते थे। इस सम्पत्ति को वेदों परीणाह्य कहा गया है। इसका संकेत तैत्तिरीय संहिता में प्राप्त होता है।

''पत्नी वै परिणाह्यस्य ईशः''

अर्थवेद विधवा स्त्री हेतु ही धन की व्यवस्था की गई है। पुत्रियाँ पुत्र की भाँति पिता की सम्पत्ति में अधिकार रखती थी। वह कन्या जो अविवाहित होकर के पिता के घर में रहती थी। उनको भी पिता की सम्पत्ति में अधिकार प्राप्त था। यह सभी सकेंत नारी की आर्थिक सफलता को व्यक्त करता है।

(ऋग्वेद 10.85.13 तथा 38)
(अर्थवेद 14.1.13)

वैदिक कालीन नारी संन्यासिनी विधान निर्मात्री के दौत्य कर्त्री ज्योतिर्विद्, प्रशिक्षिका, भूगर्भविद् आदि के रूप में विराजमान थी। वह पुरूष के साथ समत्तव रूप में जीवन यापन करती थी। तत्कालीन समाज में नारी कें सहनशीलता सौम्यता, सौष्ठवता आदि गुणों की प्रशंसा की गई है। नारी को अनेक महत्वपूर्ण विशेषणों यथा अमृतरसदायनी कहा गया है। नारी को को सत्य वचनों की प्रेरक तथा सद्सम्मति प्रदान करने वाली बताया गया है। ऋग्वेद के दशम मण्डल के 85 वें सूक्त में उसको सम्राज्ञी जैसे सम्मान–सूचक पदो से अलंकृत किया गया है।

''सम्राज्ञी श्वसुरे भव सम्राज्ञी श्वश्रवां भव।
ननान्दरि सम्राज्ञी भव सम्राज्ञी अधिदेवृषु।।''

अतः संहिता कालीन नारी उच्चतम प्रतिष्ठा की अधिष्ठात्री तथा विभिन्न अधिकारों की अधिकारिणीं थी। वैदिक युग में नारी एवं पुरूष दोनों समत्तव भाव के कारण अर्द्धनारीश्वरत्व की संकल्पना को साकार करते हुए दृष्टिगोचर होते है।

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Application of Integral Calculus in Kinematics

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ABSTRACT

Kinematics is the study of the motion of mechanical points, bodies and systems without consideration of their associated physical properties and the forces acting on them. The study is often referred to as the geometry of motion, and it models these motions mathematically using algebra. The systems in kinematics are modeled to calculate such things as speeds and ratios. Kinematics is very useful in the conceptual design of mechanical systems. Initial geometries and velocities of bodies are a part of the model. While kinematics can help determine whether a design is theoretically possible, there are more complexities when designing something for the real world. Without consideration of materials, and the forces acting upon them, many theoretically possible designs would be prone to failure. Kinetics, in contrast to kinematics, does consider physical properties such as the mass of the bodies or the forces driving them. Kinetics is logically deduced from kinematics by way of algebraic calculation of physical properties and forces. Kinetics takes into account physical forces and properties including material properties, like mass rigidity, and tensile or compressive strength.

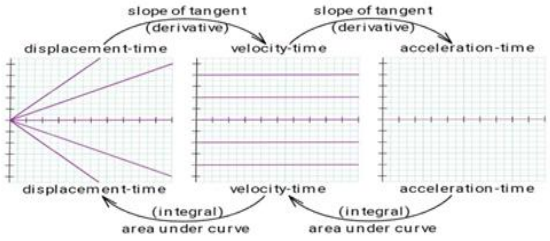
Keywords : Mechanical Points, Bodies, Mass Rigidity, Tensile, Compressive Strength

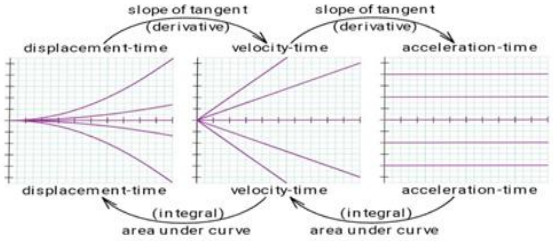
I. INTRODUCTION

APPLICATION OF KINEMATICS IN REAL WORLD

In many instances it is only important to know how an object moves, without consideration of the forces causing the motion.

- In machine components, it is common to use kinematics analysis to determine the (unknown) speed of an object, that is connected to another object moving at a known speed
- To determine the linear velocity of a piston connected to a flywheel that is turning at a known speed
- Old type writing machine, Pendulum
- Trainmoving, Moving water in a river
- Flying airplane, Bowling and hitting in cricket, shooting in basketball
- The motion of planets around sun
- Studying kinematics gives engineers insight of how the machine functions and what design aspect can be modified to achievea required motion





II. METHODS AND MATERIAL

USE OF CALCULUS IN KINEMATICS

DERIVING THREE EQUATIONS OF MOTION

- Acceleration is the rate of change of velocity of an object with respect to time .From acceleration,we derive first equation of motion

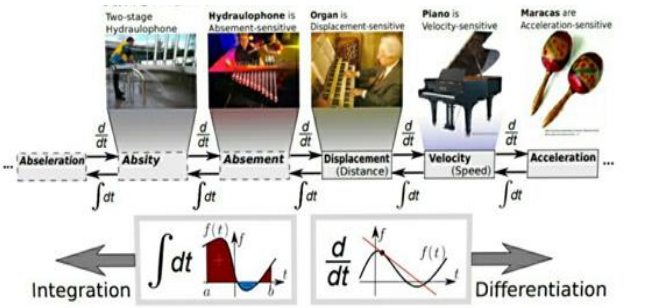


Fig. 1. The study of integral kinematics originated with water flow . The hydraulophone (underwater pipe organ) exhibits the phenomenon of absement. The two-stage hydraulophone exhibits the phenomenon of absity (the double-integral of displacement).

First Equation of Motion

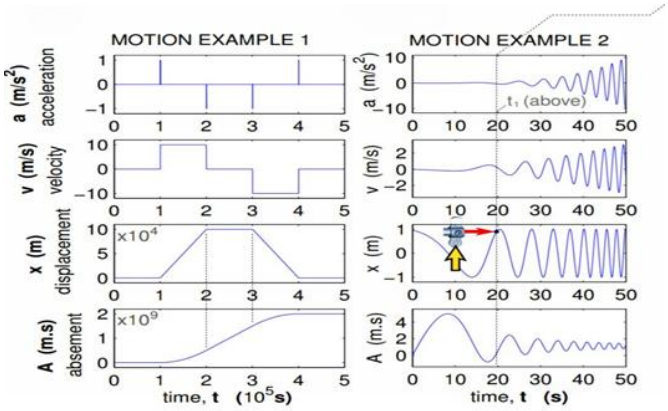
$$a = dv/dt$$

$$dv = a\,dt$$

$$\int_{v0}^{v} dv = \int_{0}^{t} a\,dt$$

$$v - v_0 = at$$

$$v = v_0 + at$$



- Velocity is a vector expression of the displacement that an object or particle undergoes with respect to time .From velocity , we derive second equation of motion

Second Equation of Motion

$$v = ds/dt$$

$$ds = v\,dt$$

$$ds = (v_0 + at)\,dt$$

$$\int_{s0}^{s} ds = \int_{0}^{t} (v_0 + at)\,dt$$

$$s - s_0 = v_0 t + at^2/2$$

$$s = s_0 + v_0 t + at^2/2$$

- From first and second equations,we derive third equation of motion

Third Equation of Motion

$$dv/ds = a * 1/v$$

$$v\,dv = a\,ds$$

$$\int_{v0}^{v} v\,dv = \int_{s0}^{s} a\,ds$$

$$\tfrac{1}{2}(v^2 - v_0^2) = a(s - s_0)$$

$$v^2 = v_0^2 + 2a(s - s_0)$$

Problems :

1. **You are driving along the street at the speed limit (35mph) and 50 meters before reaching a traffic light you notice it becoming yellow. You accelerate to make the traffic light within the 3 seconds it takes for it to turn red. What is your speed as you cross the intersection? Assume that the acceleration is constant and that there is no air resistance.**

Solution:

This is the motion with constant acceleration. If the acceleration of the car is a then we can write the expression for traveled distance:

$$s = v_0 t + \frac{at^2}{2}$$

We know the initial velocity

$$v_0 = 35mph = 0.447 * 35\ m/s = 15.645\ m/s$$

, we also know that after 3 seconds the car travels distance 50 meters. Then we can find acceleration

$$a = \frac{2(s - v_0 t)}{t^2} = \frac{2(50 - 15.645 * 3)}{9} = 0.6811\ m/s^2$$

Now we know acceleration, then we can find the final velocity:

$v_f = v_0 + at = 15.6 + 0.68 * 3 = 17.64\ m/s = 17.64/0.447\ mph = 40\ mph$

2. A speedboat increases its speed uniformly from 20 m/s to 30 m/s in a distance of 200m. Find

(a) the magnitude of its acceleration and

(b) the time it takes the boat to travel the 200-m distance.

Solution:

(a) This is the motion with constant acceleration. We can use the following equation to find the magnitude of acceleration

$$v_f^2 - v_i^2 = 2as$$

where $v_f = 30m/s$, $v_i = 20m/s$, $s = 200\ m$. Then

$$a = \frac{v_f^2 - v_i^2}{2s} = \frac{30^2 - 20^2}{2 * 200} = 1.25\ m/s^2$$

(b) We can find the time of the travel from the following equation:

$$t = \frac{v_f - v_i}{a} = \frac{30 - 20}{1.25} = 8\ s$$

3. The acceleration of an object as a function of time is $a(t) = -8t(m/s^2)$. Determine the

(a) velocity and

(b) the position of the object as a function of time

if it is located at x = 2 m and has a velocity of 3 m/s at time t = 0 s.

Solution:

(a) By definition the velocity of the object is the integral of acceleration with respect to time:

$$v(t) = v_0 + \int_0^t a(t)dt = 3 + \int_0^t (-8t)dt = 3 - 4t^2$$

where $v_0 = 3m/s$ is the initial velocity (at t=0).

(b) The position can found as an integral of velocity with respect to time:

$$x(t) = x_0 + \int_0^t v(t)dt = 2 + \int_0^t (3 - 4t^2)dt = 2 + 3t - (4/3)t^3$$

where $x_0 = 2m$ is the initial position (at t=0) of the object.

4. A toy rocket is launched with an initial velocity of 12.0 m/s in the horizontal direction from the roof of a 37.0 m -tall building. The rocket's engine produces a horizontal acceleration of $2.2\ m/s^2$, in the same direction as the initial velocity, but in the vertical direction the acceleration is $g = 9.8\ m/s^2$, downward. Air resistance can be neglected. How long is the rocket in the air before it hits the ground?

Solution:

The main difference of the motion of toy rocket in the problem from regular projectile motion is that in the projectile motion the motion in a horizontal direction is the motion with constant velocity (acceleration is 0), but in our case the motion in horizontal direction is the motion with constant acceleration.

Now we can write down the main equations, which describe the motion, and identify the known and unknown variables in these equations. There are two sets of equations:

Set 1: motion along x axis - motion with constant acceleration. There are two independent equations which describe this motion

$$x(t) = x_0 + v_0\,t + 2.2\frac{t^2}{2} = 12t + 1.1\,t^2 \quad (1)$$

Here $x_0 = 0$ (initial position), $v_0 = 12\ m/s$ - initial horizontal velocity.

$$v_x(t) = v_0 + 2.2t = 12 + 2.2t \quad (2)$$

Set 2: motion along vertical y-axis. This is the free fall motion. There are three equations, which describe this motion. Only two equations are independent, but we can keep all of them

$$y(t) = y_0 - 9.8\frac{t^2}{2} = 37 - 4.9\,t^2 \quad (3)$$

$$v_y(t) = -9.8t \quad (4)$$

$$v_y^2(t) = -2 \times 9.8 \times [y(t) - 37] \quad (5)$$

Here $y_0 = 37\ m$ - initial y-coordinate of the rocket and initial vertical (y-component) component of the velocity is zero.

At the final point the rocket hits the ground. It means that the final y-coordinate of the rocket is 0. We can substitute this value in equation (3) and find the travelled time

$0 = 37 - 4.9\,t^2$, $t = 2.7\ s$

III.CONCLUSION

The branch of mathematics in which the notion of an integral, its properties and methods of calculation are studied. Integral calculus is intimately related to differential calculus, and together with it constitutes the foundation of mathematical analysis. The origin of integral calculus goes back to the early period of development of mathematics and it is related to the method of exhaustion developed by the mathematicians of Ancient Greece. This method arose in the solution of problems on calculating areas of plane figures and surfaces, volumes of solid bodies, and in the solution of certain problems in statistics and hydrodynamics. It is based on the approximation of the objects under consideration by stepped figures or bodies, composed of simplest planar figures or special bodies (rectangles, parallelopipeds, cylinders, etc.).

IV. REFERENCES

[1]. Edmund Taylor Whittaker (1904). A Treatise on the Analytical Dynamics of Particles and Rigid Bodies. Cambridge University Press. Chapter 1. ISBN 0-521-35883-3.

[2]. Joseph Stiles Beggs (1983). Kinematics. Taylor & Francis. p. 1. ISBN 0-89116-355-7.

[3]. Thomas Wallace Wright (1896). Elements of Mechanics Including Kinematics, Kinetics and Statics. E and FN Spon. Chapter 1.

[4]. Russell C. Hibbeler (2009). "Kinematics and kinetics of a particle". Engineering Mechanics: Dynamics (12th ed.). Prentice Hall. p. 298. ISBN 0-13-607791-9.

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Point of Sale (POS) Network with Embedded Fingerprint Biometric Authentication

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ABSTRACT

The steady growth in electronic transactions has promoted the Automated Teller Machine (ATM) thereby making it the main transaction channel for carrying out financial transactions. Conventional method of identification based on possession of ID cards or exclusive knowledge like a social security number or a password are not all together reliable. However, this has also increased the amount of fraudulent activities carried out on Automated Teller Machines (ATMs) thereby calling for efficient security mechanisms and increasing the demand for fast and accurate user identification and authentication in ATMs. In this paper, an embedded fingerprint biometric authentication scheme for Point of Sale (POS) network as additional security option to the ATM card is proposed. A fingerprint biometric technique was fused with personal identification numbers (PIN's) for authentication to upgrade the security level. The proposed idea will solve the problems that may face the customers such as theft, counterfeiting, oblivion or loss the card. Therefore, the customer will be identified once putting his finger on the reader (based on finger scanning) and the system recognizes the customer without requiring keys or cards of support. We have distributed a questioner to 586 responders, the obtained results show the importance of fingerprint biometric authentication for POS network as additional security option to the ATM card.

Keywords : POS, ATM, Fingerprint, Security, Biometric.

I. INTRODUCTION

The Automated Teller Machines (ATMs) provide numerous monetary services to the society and the number of users has increased tremendously due to the promotion of cashless societies by major financial institutions [1-5]. Existing ATMs are based on plastic cards with a metallic chip which is combined with a PIN (Personal Identification Number) [6]. Together this serves as a medium for logging into the banking platform of the ATM in use. The current form of authentication has withstood the taste of time but however, it has not been fail proof as previous research has shown [7, 8]. Individuals making use of ATMs have complained of lost funds due to hackers gaining knowledge of their PINs [9] and furthermore, many individuals have also bemoaned the inability to carry out transactions due to lost or damaged debit cards thereby having to pay for a replacement. These factors have been tackled by previous researchers who propose the introduction of a biometric method of authenticating individuals and the banking community especially in developing countries with a high a level of crime and financial fraud rate.

Biometrics can be defined as a measurable physiological and behavioral characteristic that can be captured and subsequently compared with another instance at the time of verification. It is an automated method of recognizing a person based on physiological or behavioral characteristic. It is a measure of an individual's unique physical or behavioral trait which can be used in validating or authenticating an individual. Common physical biometric characteristics include fingerprints, hand or palm geometry, retina, iris and facial scans while common behavioral characteristics are signature, handwriting, keystrokes and voice match. Biometrics technologies are a very secure way of authentication, this is due to the uniqueness of biometric data which cannot be shared, copied or lost. The authors in [10] pointed out that biometric based authentication offers several advantages over other authentication mechanisms and research has shown that the fingerprint technology in particular, can give a considerably more precise and reliable client validation.

The technological revolution influenced everything [11-46], even the methods that aim to improve the shopping and banking systems. Today, the use of Artificial Intelligence (AI) algorithms is expansive, particularly in providing solutions to challenging problems including patterns recognition and retrieval of information [26, 39, 43, 47-61], image segmentation [11, 12, 22, 42, 62-66], analysis of medical images [67-71], Learning Management System [72-97], nurse rostering problem [41], Healthcare Monitoring system [25, 98], as well as prediction of river flow [40, 99, 100]. Accordingly, many systems have used the Artificial Intelligence as an effective tool for biometric authentication and using it in the transactions and banking systems [101-103].

According to the tremendous technology revolution in 21st Century, many countries have begun to replace traditional tools with more modern tools. Technology is absolutely important in everyone's life. Therefore, the countries have started using technology more than it used to be, because of its direct impact on their economy, some of the problems that were faced by these countries have been solved by using technology. Also, the financial sector started to develop financial services by using the financial technology (FinTech), which is one of the most important technologies, invented to help financial institutions to increased number of customers in each institution and satisfy their desires. Henceforth, the idea of finding a secure alternative to the debit card to solve all it problems (such as; theft, card loss and fraud), by adding fingerprint to the POS machine will reduce the incidence of these Problems as well as saving time and effort.

II. RELATED WORK

2.1 Mada Pay

Mada pay is a smart mobile payment service with a special application that has the highest standards of security and encryption of private information. It allows cardholders to keep their entire bank card (both current and credit linked) in one application on smart phones. The cardholder will be able to complete the payment process for purchases up to a maximum of 100 Riyals per purchase, once the smart phone is passed after opening the lock of the phone using the secret code, On the POS device supported by the service. There is no limit to the cards that can be saved in the Pay application, and the same card can be saved on more than one device. Pay Range is widely accepted within and outside the kingdom for millions of stores that support NFCs based on National Payment system in line with international

networks supported by the card used. What is known as the near-communication technique is the abbreviation of Near Field Communication (NFC) Is a 13.56 MHz wireless communication technology that can transmit data at a maximum speed of 474 kbps and is different from being able to exchange data in a very narrow range not exceeding 4 centimeters between the two ends of the exchange of information (phone, receiver or other phone). Use of financial transactions is possible because it is so secure that it cannot be remotely dealt with remotely [104].

2.2 POS devices (mPOS)

This service enables you to pay your purchases from any trade shows available at this point (POS) using ATM cards and credit cards (Visa, Mastercard and American). Express). The POS network transfers the amount of your purchases from the card account to the merchant account as these accounts are within the scope of the Saudi Payment Network, the GCC network, MasterCard, Visa and American Express. The POS device allows the merchant to accept all types of bank cards (Mada, MasterCard, Visa and American Express cards). It is the ideal payment option for cardholders rather than cash, and is the most convenient payment solution for mobile business owners. The device will be linked to the merchant account at the bank to settle the amounts of transactions quickly, easily and safely, with the possibility of the trader to report the transactions executed through the device and the total amounts settled through the Internet banking companies and institutions (Flex Business) [105].

III. PROJECT DESCRIPION

Absumha service allows the customer to use the POS network with the ATM card and the fingerprint. Therefore; it requests from the customer to enter PIN number and his/her fingerprint to be placed on a Fingerprint reader. The fingerprint reader accepts the fingerprint and seeks to match the live sample with the already registered templates in the banks database. When the fingerprint is found correct, the customer will be able to do the required payment, otherwise the customer is denied access. The system also allows the customer to use more than one account in several banks so that he chooses the bank that he/she wants to withdraw the amount from it. The service will provide security, privacy and ease of use for the customer. The bank will also benefit from fees for financial transactions as well as maintenance, installation and replacement fees. The Saudi Payments Network will receive a portion of the fees. The benefit will also count merchants as it will reduce the problems they face in paying, procrastination and the delay of payments.

Figure 1 : The proposed POS with Embedded Fingerprint Biometric Authentication.

The POS device consists of physical parts as shown in figure 1, a scanner that reads the customer's fingerprint, a screen showing all the customer's data including the account number and the amount to be deducted, cards and a receipt, a keyboard containing the numbers and button of entry and withdrawal, as well as confirm and correct the operation and the port of the card. Also, the logo of absumha project was designed as shown in Figure 2.

Figure 2 : The proposed logo for the project

IV. FEASIBILITY STUDY

For market study, a questionnaire consisting of 16 questions was presented. The number of males who answered the questionnaire was 159 and the number of females was 427. In response to the questionnaire, the market need was derived from the use of the fingerprint POS network. The majority of 198 respondents responded to the need for a fingerprint system, while those who preferred ATM cards numbered 69, while those who did not mind using both methods were 319. Moreover, the results of the questionnaire revealed that there are many drawbacks faced by people using ATM cards such as the expiration of the card, forgetting and losing the card as well. The majority of respondents believed that the fingerprint system would reduce theft and counterfeiting, and the majority expressed their desire to document their register with the banks if the idea was applied. Respondents also said that the fingerprint system would save a lot of time as well as facilitate their payments.

4.1 Marketing study

4.1.1. Product Description

Absumha service allows the customer to use the POS network with the ATM card and the fingerprint. The idea is to put the customer finger in the fingerprint reader in the POS network, where the customer's fingerprint is linked to his bank account in advance. The system also allows the customer to use more than one account in several banks so that he chooses the bank to deduct the amount of the process through. The POS network is small in size and easy to use and provided by banks, and the people who will get benefit from it are customers, banks and traders. The service will provide security, privacy and ease of use for the customer. The bank will also benefit from fees for financial transactions as well as maintenance, installation and replacement fees. The Saudi Payments Network will receive a portion of the fees.

4.1.2 Market Description

Market segmentation aims at dividing the market into homogeneous sectors with each sector being viewed as a marketing objective by creating an appropriate marketing mix for each category. Absumha service will be based on financial services. On the basis of this, the financial market will be divided into individuals and companies, where the focus will be on the business sector, which is divided into small, medium and large companies. In addition, the market for which we will provide this service is a competitive market where there are many competitors who are developing services rapidly as Atheer service provided by most banks which is one of the most competitors that has developed the POS network service. Table 1 below shows the characteristics of the target sector, where the service of the company focuses on the business sector of all sizes.

Table 1 : illustrates the characteristics of the target sector

Comparison criteria	Small Companies	Medium Companies	Large Companies
Independence of the Board of Directors	N/A	More independent than small	Full independence
Use of technology	**Simple technology**	**More sophisticated technology**	Advanced technology
Number of employees	**Few**	**Medium**	Large
Ability to innovate	Low	Medium	High
Capital size	**Limited**	**Medium**	Large
Need for funding	Low (high fluidity)	Medium	Large
Savings and investment	More savings and less investment	The correlation between savings and investment	Less savings and more investment
Risk and return	**Low risk and return**	**Balance between risk and return**	High risk and return
The need for marketing operations according to their market share	High because of its low market share	Medium	Less because of its high market share

The questionnaire clearly shows the need to activate the service of the fingerprint and make sure that there is an alternative to the ATM card because of the many problems that accompany it. Table 2 shows the number of transactions in the period from 2013 to 2017, the table shows that POS operations are increasing from year to year, indicating that the fingerprint system will be very popular with customers in the future.

Table 2 : shows the number of transactions using POS network

Period	Sales (in 1000 SR)	Period	Number of POS devices
2013	134,194,183	265,315,873	107,763
2014	**159,970,264**	**327,034,423**	**138,779**
2015	172,835,453	394,915,865	225,372
2016	**182,748,679**	**524,569,736**	**267,827**
2017	200,467,827	708,119,092	299,942

http://www.sama.gov.sa/ar-sa/pages/defult.aspx,wed,21Mar,2018,8:03AM

One of the factors influencing the demand is the fear of using modern technical means. Therefore, it may not be available in all shops, and the demand at the beginning of the fingerprint service will be few. So Absumha will be announced through an explanatory video of the service in the social network.

Packaging:

The packaging of the POS machine is shown in figure 3 which includes:

1. POS device
2. The seller's card uses for refunds
3. Charger and base
4. Printing paper receipt.
5. A publication for customers clarifying the service.
6. Cable for charging and internet connection.
7. Fingerprint scanner.

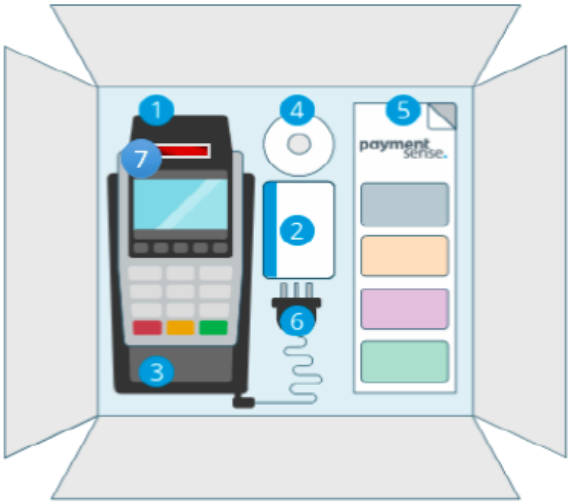

Figure 3 : Shows the method of packaging

Demand will be predicted by descriptive prediction, due to lack of historical data on demand. This prediction will be medium-term since it will provide a new service and add on the current POS network device. The survey also revealed that the total numbers of customers who wish to add a fingerprint in the POS network are 79.2% from 591 people; this indicates customer desire for this new service.

4.1.3 Marketing Mix

- **Banking Service**

The fingerprint service has been introduced using the POS network, which aims to satisfy customers' need for a secure alternative. It provides time and effort besides the ATM card, where the customer is considered the cornerstone of service delivery. Currently, there are some alternatives that may affect the fingerprint service using the POS network such as Atheer, ATM and apple pays. However, after conducting a market study, customers are faced by problems with using an ATM card, losing or falsifying it, and fingerprint service is characterized by high security.

- **Pricing of Banking Services**

If the idea is sold to the banks, the price will be five hundred thousand Saudi Riyals based on the value invested from the production stage to the stage of developing the marketing strategies used. On the other hand, if the fingerprint using the POS network device is sold, the cost is estimated at SR 5,000 plus a profit margin of 2.5%, through the view of some sites in addition to communication with the Saudi banks to know the final cost. POS networks will be distributed through the bank to merchants or customers via direct distribution.

- **Promotion of banking services**

The bank advertising is one of the means of promotion that will be used to promote Absumha service, which aims to deliver all information related to the service to customers. The advertisement will clarify the shape of the device and what are the fingerprint service using POS networks and its features. Table 3 shows the cost of promoting Absumha service.

Table 3 : The cost of promoting Absumha service

Type	Cost/Percentage	Details of numbers
Cost	SR 5,000	The cost is estimated at 5000, depending on the contact with the official at the Saudi Investment Bank and with the suppliers.
Revenue	The revenue on the single transaction through the ATM card is 0.8%, while the revenue per transaction through the fingerprint is 0.95%, and the revenue per transaction through the credit card is 2.5%.	Revenue is obtained through the number of transactions. The bank takes 0.8% of the transaction through the ATM card and takes 2.5% on the one transaction through the credit card.
Profit margin	2.5%	The profit margin was estimated at 2.5% because of competition in the banking sector. Traders prefer to get the device at a lower cost.
Cost of promotion	SR 30,400	The cost of the video is estimated at 6000 riyals based on the video designer, and 4000 riyals on advertising in social media such as Twitter, Instagram and Snape Chat according to the number of times it appeared in the advertisement. SR 20400 is the cost of the publications is in the branches of the bank, indicating its service to the customers, based on communication with the Sahara Advertising Agency for advertising services.

- **Design Distribution Structure**

Absumha service will be distributed through the bank to merchants or customers, which means direct distribution policy will be followed. The service will cover most of the shops, where the distribution policy will be used through the wider presentation of the service through a simple and comprehensive advertising of the idea to be clear, and to become accessible to the largest possible number of beneficiaries. This is through the offer of banks to it, where the bank to submit and offer to the Saudi Arabian Monetary Agency to apply as an addition to the POS network and Sama apply the idea effectively and distribute to the banks that request it.

4.2 Technical study

Technical feasibility study is one of the cornerstones of the feasibility study. Technical feasibility study leads to the clarity the technical aspects of the fingerprint service bt POS network. Technical feasibility study depends on the results obtained from the marketing study. We will mention location of the service, machinery and equipment required for the service, identification of the required production elements and identification of the requirements and other services required by the service will be addressed.

4.2.1 Locate the service

It is the responsibility of the Bank to choose the appropriate location to provide fingerprint service by the POS network, and must be close to the target groups.

4.2.2 Determining the service area

The project does not need to allocate land or space to its own production unit, because the suppliers will be dependent on the manufacturer of the device with its own specifications.

Fingerprint with POS network will include 3 parts:

1. The final form which requires an indication of how the project will be presented.
2. Mechanism of work, which shows how the POS machine works using the fingerprint.
3. After-sale services.

4.2.3 Machinery and equipment for service

This service depends on the computer hardware to have the necessary software and databases. The costumer has to submit his fingerprint to be certified in case he wants to make payments with his fingerprint as a second option to the card. When the customer wants to make payments through the POS network using the fingerprint, the machine shows him all the banks accounts and he has to selects one of them.

- Tools used:

[1]. Network payment system.
[2]. Charge coupled device.

- Programs used:

Saudi Payments Network (SPAN): Connects ATMs and POS networks throughout the Kingdom of Saudi Arabia with a central network. Some bank programs are confidential so they cannot be compromised. Table 4 provides description of the tools necessary to the service to work properly.

Table 4 : Description of the tools necessary for the service

Tools	Description
Device shape	It is a device that provides service with an ATM card port and a fingerprint scanner and contains several buttons.
System to link client accounts	It is a system that shows the coaster accounts if he chooses the payment system by footprint
Port card	It is a special port for the card that the machine can read to be drawn from
Saudi Payments Network (SPAN)	It works to connect the device with a POS network all over Saudi Arabia with a central network.
charge device coupled	It is a matrix of light-sensitive cells that produces a light when exposed to a digital cycle electronically recorded, when the customer puts his finger on the device to identify the client's accounts.
Other programs	Bank programs are confidential, so they are not hacked.

4.2.4 Production elements

This service requires many elements of production and other inputs to be finished in final form and the project requires tangible part which will be made by mada machines or from external industries. We make the design as described in the product description to suit the model to be done.

- **Permits**

Point-of-sale services were introduced in 1990 in Saudi Arabia. Customers are provided with point-of-sale terminals through banks through the Merchant Agreement System (MSP). The Saudi Arabian Monetary Agency (SAMA) has also provided a point-of-sale engineer in each bank.

Banks and POS suppliers such as JEDIA should follow up the licenses issued by the Saudi Arabian Monetary Agency (SAMA). SAMA Department of Quality Assurance and Quality Assurance ensures the integrity of the purchasing process carried out through POS networks using the fingerprint, and technical testing is required to ensure that point-of-sale devices comply with international standards such as the EMVco standard.

- **Disclosure rules**

Trader Bank shall have access to all information related to the transactions made through the service, for the purpose of verifying the banking authorities (SAMA) on the operation process and the merchant's should accept this.

- **Protection**

Trader shall bear all costs and damages that may be incurred by the Bank as a result of negligence or misconduct of the Trader in connection with the transactions performed through service. In addition, the Bank is entitled to immediately suspend the Service from the Authority permanently or temporarily or to reserve any amount in the Trader's accounts until the damage and potential losses have been determined.

- **Statements and Guarantees**

The Bank and the merchant shall acknowledge and guarantee the following:

[1]. The merchant has full authority to sign the agreement on the networks of POS and to fulfill the obligations contained therein.
[2]. The dealer signing the agreement of the POS network will not conflict with SAMA documents.
[3]. The trader must, at the time of signature of the agreement, continue to apply it throughout the contract period in accordance with applicable regulations.

- **Marketing services**

a. The promotion of the service will be through a video graphic that explains the service to customers.
b. Publication of the advertisement in the social media such as Twitter, Instagram and Snapchat.
c. Publications in the branches of the bank to show the service for customers.

4.3 Financing Study

4.3.1 Net present value

- The initial capital cost is SR 5000 after contacting the suppliers. This cost was calculated after adding the fingerprint to the POS network.
- Cash flow (annual revenue on transactions to be performed by merchant customers):

1. Revenue on ATM card (2.5%)
2. Revenue on Visa and Mastercard (2.5%)
3. Revenue on fingerprint (0.95%)

Where the previous percentages (ATM, Visa and Mastercard) are reached from the banks, and as for the fingerprint, it is reached according to the Bank's desire to make profit. The revenue for the first six years of the project will be calculated below:

- **First Year 2020**

The number of operations was forecasted based on previous data released by the Saudi Arabian Monetary Agency and showing the number of previous POS transactions in the Kingdom of Saudi Arabia as a whole. Hence, the last year 2019-2018 was based on the forecast for 2020, which was estimated by researchers as a new addition to the POS system. So, the researcher agreed on 4.25% in the first year.

- **Calculation of Initial Investment Cost**

As for the cost of the initial investment after we contacted several banks on the number of devices to be produced in the first year, especially as it is a new idea, Therefore, the Bank decided to contact the suppliers to request 10 thousand devices in the first year, where the initial investment cost is 50 million Saudi Riyals. And the result is that when the launch of any new project accompanied by apprehension by customers, initially the sales was expected about 10,000 thousand devices in the first year, that is, the initial investment cost for the first year:

10000 x 5000 = 50 million

According to preliminary calculations, the revenues obtained through the Absumha service for the next six years will cover the costs incurred. This shows that the investment is feasible and successful, and that the implementation of this project will generate profits.

V. CONCLUISON

In this paper, an embedded fingerprint biometric authentication scheme for Point of Sale (POS) network as additional security option to the ATM

card was proposed. A fingerprint biometric technique was fused with personal identification numbers (PIN's) for authentication to upgrade the security level. The results of the study show the importance of having an additional substitute for the ATM card when dealing with the POS check. We conducted a feasibility study including marketing, technical and financial study, as well as analysis of time, cost, risks and expected problems. This service facilitates the customer to conduct daily transactions through the existence of an alternative to secure the card, and based on the results of the questionnaire, which showed the need of customers to have a safe alternative to the card and high support for the idea is expected as it will reduce the problems related to the ATM cards.

VI. REFERENCES

[1]. J. O. Adeoti, "Automated teller machine (ATM) frauds in Nigeria: The way out," Journal of Social Sciences, vol. 27, pp. 53-58, 2011.

[2]. P. A. Ochang and P. O. Ofem, "An Enhanced Automated Teller Machine Security Prototype using Fingerprint Biometric Authentication," International Journal of Advanced Networking and Applications, vol. 8, p. 3110, 2017.

[3]. F. S. Hossian, A. Nawaz, and K. Grihan, "Biometric authentication scheme for ATM banking system using energy efficient AES processor," International Journal of Information and Computer Science, vol. 2, pp. 57-63, 2013.

[4]. J. B. Awotunde, T. R. James, S. I. Abdulkadir, and F. T. Adewunmi-Owolabi, "Fingerprint Authentication System: Toward Enhancing ATM Security," 2014.

[5]. M. Dutta, K. K. Psyche, and S. Yasmin, "ATM transaction security using fingerprint recognition," Am J Eng Res (AJER), vol. 6, pp. 2320-0847, 2017.

[6]. K. R. Khatmode Ranjit, Ghodke Bharat ,P.P.Chitte,Anap S.D, "ARM7 Based Smart ATM Access & Security System Using Fingerprint Recognition & GSM Technology," International Journal of Emerging Technology and Advanced Engineering, vol. 4, pp. 856-860, 2014.

[7]. V. Padmapriya and S. Prakasam, "Enhancing ATM security using fingerprint and GSM technology," International Journal of Computer Applications, vol. 80, 2013.

[8]. A. Jaiswal and M. Bartere, "Enhancing ATM Security Using Fingerprint and GSM Technology," International Journal of Computing Science and Mobile Computing (IJCSM), vol. 3, 2014.

[9]. M. O. Onyesolu and I. M. Ezeani, "ATM security using fingerprint biometric identifer: An investigative study," International Journal of Advanced Computer Science and Applications, vol. 3, pp. 68-72, 2012.

[10]. S. S. Ghodke, H. Kolhe, S. Chaudhari, K. Deshpande, and S. Athavle, "ATM transaction security system using biometric palm print recognition and transaction confirmation system," International Journal Of Engineering And Computer Science, vol. 3, pp. 5332-5335, 2014.

[11]. M. k. Alsmadi, K. B. Omar, S. A. Noah, and I. Almarashdah, "Performance Comparison of Multi-layer Perceptron (Back Propagation, Delta Rule and Perceptron) algorithms in Neural Networks," in 2009 IEEE International Advance Computing Conference, 2009, pp. 296-299.

[12]. Z. Thalji and M. Alsmadi, "Iris Recognition using robust algorithm for eyelid, eyelash and shadow avoiding," World Applied Sciences Journal, vol. 25, pp. 858-865, 2013.

[13]. M. Alsmadi, U. A. Badawi, and H. E. Reffat, "A High Performance Protocol for Fault Tolerant Distributed Shared Memory (FaTP)," Journal of Applied Sciences, vol. 13, pp. 790-799, 2013.

[14]. F. HADDAD, J. ALFARO, and M. K. ALSMADI, "HOTELLING'S T² CHARTS USING WINSORIZED MODIFIED ONE STEP M-ESTIMATOR FOR INDIVIDUAL NON NORMAL DATA," Journal of Theoretical & Applied Information Technology, vol. 72, pp. 215-226, 2015.

[15]. F. Haddad and M. K. Alsmadi, "Improvement of The Hotelling's T2 Charts Using Robust Location Winsorized One Step M-Estimator (WMOM)," Journal of Mathematics (ISSN 1016-2526), vol. 50, pp. 97-112, 2018.

[16]. M. K. Alsmadi, U. A. Badawi, and H. M. Moharram, "SERVER FAILURES ENABLED JAVASPACES SERVICE," Journal of Computer Science, vol. 10, pp. 671-679, 2014.

[17]. M. K. Alsmadi, "Apparatus and method for lesions segmentation," ed: US Patent App. 15/614,893, 2018.

[18]. M. K. Alsmadi, "Facial expression recognition," ed: Google Patents, 2018.

[19]. R. Aldaej, L. Alfowzan, R. Alhashem, M. K. Alsmadi, I. Al-Marashdeh, U. A. Badawi, M. Alshabanah, D. Alrajhi, and M. Tayfour, "Analyzing, Designing and Implementing a Web-Based Auction online System," International Journal of Applied Engineering Research, vol. 13, pp. 8005-8013, 2018.

[20]. H. Almaimoni, N. Altuwaijri, F. Asiry, S. Aldossary, M. Alsmadi, I. Al-Marashdeh, U. A. Badawi, M. Alshabanah, and D. Alrajhi, "Developing and Implementing WEB-based Online Destination Information Management System for Tourism," International Journal of Applied Engineering Research, vol. 13, pp. 7541-7550, 2018.

[21]. I. A. Almrashdeh, N. Sahari, N. A. M. Zin, and M. Alsmadi, "Requirement analysis for distance learning management system students in Malaysian universities," Journal of Theoretical and Applied Information Technology, vol. 24, pp. 17-27, 2011.

[22]. M. k. Alsmadi, K. B. Omar, and S. A. Noah, "Proposed method to decide the appropriate feature set for fish classification tasks using Artificial Neural Network and Decision Tree," IJCSNS vol. 9, pp. 297-301, 2009.

[23]. N. Alsubaie, N. Althaqafi, E. Alradwan, F. Al-Hazza, M. Alsmadi, I. Al-Marashdeh, U. A. Badawi, M. Alshabanah, D. Alrajhi, S. Alsmadi, and M. Tayfour, "Analyzing and Implementing an Online Metro Reservation System," International Journal of Applied Engineering Research, vol. 13, pp. 9198-9206, 2018.

[24]. D. A. Daniyah Alkhaldi, Hajer Aldossary, Mutasem k. Alsmadi, Ibrahim Al-Marashdeh, Usama A Badawi, Muneerah Alshabanah, Daniah Alrajhi, "Developing and Implementing Web-based Online University Facilities Reservation System," International Journal of Applied Engineering Research, vol. 13, pp. 6700-6708, 2018.

[25]. i. Almarashdeh, M. K. Alsmadi, T. Farag, A. S. Albahussain, U. A. Badawi, N. Altuwaijri, H. Almaimoni, F. Asiry, S. Alowaid, M. Alshabanah, D. Alrajhi, A. A. Fraihet, and G. Jaradat, "Real-Time Elderly Healthcare Monitoring Expert System Using Wireless Sensor Network " International Journal of Applied Engineering Research, vol. 13, pp. 3517-3523, 2018.

[26]. M. K. S. Al Smadi, "Fish Classification Using Perceptron Neural Network," Centre for Graduate Studies, Universiti Utara Malaysia, 2007.

[27]. M. K. Alsmadi and U. A. Badawi, "Pattern matching in Rotated Images Using Genetic Algorithm," Journal of King Abdulaziz University Computing and Information vol. 5, pp. 53 - 59, 2017.

[28]. S. Aldossary, A. Althawadi, M. Almotairy, M. k. Alsmadi, D. Alrajhi, M. Alshabanah, I. AlMarashdeh, M. Tayfour, and R. Aljamaeen, "ANALYZING, DESIGNING AND IMPLEMENTING A WEB-BASED COMMAND CENTER SYSTEM," International Research Journal of Engineering and Technology, vol. 6, pp. 1008-1019, 2019.

[29]. R. A. Sheikh, R. Al-Assami, M. Albahr, M. A. Suhaibani, M. k. Alsmadi, M. Alshabanah, D. Alrajhi, I. Al-Marashdeh, S. Alsmadi, H. Abouelmagd, and M. Tayfour, "Developing and Implementing a Barcode Based Student Attendance System," International Research Journal of Engineering and Technology, vol. 6, pp. 497-506, 2019.

[30]. S. A. S. Ali, K. E. H. I. Eldaw, M. K. Alsmadi, and I. Almarashdeh, "Determinants of deposit of commercial banks in Sudan: an empirical investigation (1970-2012)," International Journal of Electronic Finance, vol. 9, pp. 230-255, 2019.

[31]. L. Eljawad, R. Aljamaeen, M. K. Alsmadi, I. Al-Marashdeh, H. Abouelmagd, S. Alsmadi, F. Haddad, R. A. Alkhasawneh, M. Alzughoul, and M. B. Alazzam, "Arabic Voice Recognition Using Fuzzy Logic and Neural Network," International Journal of Applied Engineering Research, vol. 14, pp. 651-662, 2019.

[32]. M. K. Alsmadi, M. Tayfour, R. A. Alkhasawneh, U. Badawi, I. Almarashdeh, and F. Haddad, "Robust feature extraction methods for general fish classification," International Journal of Electrical & Computer Engineering (2088-8708), vol. 9, 2019.

[33]. F. Haddad, M. K. Alsmadi, U. Badawi, T. Farag, R. Alkhasawneh, I. Almarashdeh, and W. Hassan, "Bivariate modified hotelling's T^2 charts using bootstrap data," International Journal of Electrical & Computer Engineering (2088-8708), vol. 9, 2019.

[34]. A. M. Al-Smadi, M. K. Alsmadi, A. Baareh, I. Almarashdeh, H. Abouelmagd, and O. S. S. Ahmed, "Emergent situations for smart cities: a survey," International Journal of Electrical & Computer Engineering (2088-8708), vol. 9, 2019.

[35]. R. Al-Theeb, H. Al-Tami, H. Al-Johani, A. Al-Mutairi, I. Al-Marashdeh, M. K. Alsmadi, M. Alshabanah, and D. Alrajhi, "Developing and Implementing A System for Shipping Companies Comparison," IJSRST vol. 6, 2019.

[36]. I. Almarashdeh, G. Jaradat, A. Abuhamdah, M. Alsmadi, M. B. Alazzam, R. Alkhasawneh, and I. Awawdeh, "The Difference Between Shopping Online Using Mobile Apps and Website Shopping: A Case Study of Service Convenience."

[37]. M. K. Alsmadi, "Query-sensitive similarity measure for content-based image retrieval using meta-heuristic algorithm," Journal of King Saud University-Computer and Information Sciences, vol. 30, pp. 373-381, 2018.

[38]. I. Almarashdeh, K. E. Eldaw, M. AlSmadi, U. Badawi, F. Haddad, O. A. Abdelkader, G. Jaradat, A. Alkhaldi, and Y. Qawqzeh, "Search Convenience and Access Convenience: The Difference Between Website Shopping and Mobile Shopping," in International Conference on Soft Computing and Pattern Recognition, 2018, pp. 33-42.

[39]. M. Alsmadi, "Facial recognition under expression variations," Int. Arab J. Inf. Technol., vol. 13, pp. 133-141, 2016.

[40]. M. K. Alsmadi, "Forecasting River Flow in the USA Using a Hybrid Metaheuristic Algorithm with Back-Propagation Algorithm," Scientific Journal of King Faisal University (Basic and Applied Sciences), vol. 18, pp. 13-24, 2017.

[41]. G. M. Jaradat, A. Al-Badareen, M. Ayob, M. Al-Smadi, I. Al-Marashdeh, M. Ash-Shuqran, and E. Al-Odat, "Hybrid Elitist-Ant System for Nurse-Rostering Problem," Journal of King Saud University-Computer and Information Sciences, 2018.

[42]. T. H. Farag, W. A. Hassan, H. A. Ayad, A. S. AlBahussain, U. A. Badawi, and M. K. Alsmadi, "Extended Absolute Fuzzy Connectedness Segmentation Algorithm Utilizing Region and Boundary-Based Information," Arabian Journal for Science and Engineering, pp. 1-11, 2017.

[43]. M. Alsmadi, K. Omar, S. Noah, I. Almarashdeh, S. Al-Omari, P. Sumari, S. Al-Taweel, A. Husain, N. Al-Milli, and M. Alsmadi, "Fish recognition based on robust features extraction from size and shape measurements using neural network," Information Technology Journal, vol. 10, pp. 427-434, 2009.

[44]. R. Al-Theeb, H. Al-Tami, H. Al-Johani, A. Al-Mutairi, I. Almarashdeh, M. Alsmadi, M. Alshabanah, and D. Alrajhi, "Developing and Implementing A System for Shipping Companies Comparison," AL-THEEB, R., AL-TAMI, H., AL-JOHANI, H., AL-MUTAIRI, A., AL-MARASHDEH, I., ALSMADI, MK, ALSHABANAH, M. & ALRAJHI, D, 2019.

[45]. E. Alomari, M. Alshammry, S. Alhamil, M. Alsmadi, M. Alshabanah, D. Alrajhi, I. Almarashdeh, and L. Eljawad, "Analyzing, Designing and Implementing a Consulting Company for Management Information Systems," ALOMARI, E., ALSHAMMRY, M., ALHAMIL, S., ALSMADI, MK, ALSHABANAH, M., ALRAJHI, D., ALMARASHDEH, I. & ELJAWAD, L, pp. 422-432, 2019.

[46]. M. khalil Alsmadi, K. B. Omar, S. A. Noah, and I. Almarashdah, "Performance comparison of multi-layer perceptron (Back Propagation, Delta Rule and Perceptron) algorithms in neural networks," in 2009 IEEE International Advance Computing Conference, 2009, pp. 296-299.

[47]. A. M. Al Smadi, M. K. Alsmadi, H. Al Bazar, S. Alrashed, and B. S. Al Smadi, "Accessing Social Network Sites Using Work Smartphone for Face Recognition and Authentication," Research Journal of Applied Sciences, Engineering and Technology, vol. 11, pp. 56-62, 2015.

[48]. M. Alsmadi, K. Omar, and I. Almarashdeh, Fish Classification: Fish Classification Using Memetic Algorithms with Back Propagation Classifier: LAP LAMBERT Academic Publishing, 2012.

[49]. M. Alsmadi, K. Omar, S. Noah, and I. Almarashdeh, "A hybrid memetic algorithm with back-propagation classifier for fish classification based on robust features extraction from PLGF and shape measurements," Information Technology Journal, vol. 10, pp. 944-954, 2011.

[50]. M. Alsmadi, K. B. Omar, S. A. Noah, and I. Almarashdeh, "Fish Recognition Based on Robust Features Extraction from Size and Shape Measurements Using Neural Network " Journal of Computer Science, vol. 6, pp. 1088-1094, 2010.

[51]. M. K. Alsmadi, "An efficient similarity measure for content based image retrieval using memetic algorithm," Egyptian Journal of Basic and Applied Sciences.

[52]. M. K. Alsmadi, "Query-sensitive similarity measure for content-based image retrieval

using meta-heuristic algorithm," Journal of King Saud University - Computer and Information Sciences.

[53]. M. K. Alsmadi, A. Y. Hamed, U. A. Badawi, I. Almarashdeh, A. Salah, T. H. Farag, W. Hassan, G. Jaradat, Y. M. Alomari, and H. M. Alsmadi, "FACE IMAGE RECOGNITION BASED ON PARTIAL FACE MATCHING USING GENETIC ALGORITHM," SUST Journal of Engineering and Computer Sciences (JECS), vol. 18, pp. 51-61, 2017.

[54]. M. K. Alsmadi, K. B. Omar, S. A. Noah, and I. Almarashdeh, "Fish recognition based on robust features extraction from color texture measurements using back-propagation classifier," Journal of Theoritical and Applied Information Technology, vol. 18, 2010.

[55]. U. A. Badawi and M. K. Alsmadi, "A GENERAL FISH CLASSIFICATION METHODOLOGY USING META-HEURISTIC ALGORITHM WITH BACK PROPAGATION CLASSIFIER," Journal of Theoretical & Applied Information Technology, vol. 66, pp. 803-812, 2014.

[56]. M. Yousuf, Z. Mehmood, H. A. Habib, T. Mahmood, T. Saba, A. Rehman, and M. Rashid, "A Novel Technique Based on Visual Words Fusion Analysis of Sparse Features for Effective Content-Based Image Retrieval," Mathematical Problems in Engineering, vol. 2018, 2018.

[57]. R. R. Saritha, V. Paul, and P. G. Kumar, "Content based image retrieval using deep learning process," Cluster Computing, pp. 1-14, 2018.

[58]. M. K. Alsmadi, K. B. Omar, and S. A. Noah, "Fish recognition based on robust features extraction from size and shape measurements using back-propagation classifier," International Review on Computers and Software, vol. 5, pp. 489-494, 2010.

[59]. M. K. Alsmadi, K. B. Omar, S. A. Noah, and I. Almarashdeh, "Fish recognition based on robust features extraction from size and shape measurements using neural network," Journal of Computer Science, vol. 6, p. 1088, 2010.

[60]. M. K. S. Alsmadi, K. B. Omar, S. A. Noah, and I. Almarashdah, "Fish recognition based on the combination between robust feature selection, image segmentation and geometrical parameter techniques using Artificial Neural Network and Decision Tree," arXiv preprint arXiv:0912.0986, 2009.

[61]. M. Alsmadi, K. B. Omar, and S. A. Noah, "Back propagation algorithm: the best algorithm among the multi-layer perceptron algorithm," International Journal of Computer Science and Network Security, vol. 9, pp. 378-383, 2009.

[62]. M. K. Alsmadi, "A hybrid Fuzzy C-Means and Neutrosophic for jaw lesions segmentation," Ain Shams Engineering Journal.

[63]. U. A. Badawi and M. K. S. Alsmadi, "A Hybrid Memetic Algorithm (Genetic Algorithm and Great Deluge Local Search) With Back-Propagation Classifier for Fish Recognition " International Journal of Computer Science Issues, vol. 10, pp. 348-356, 2013.

[64]. A. M, O. K, and N. S, "Back Propagation Algorithm : The Best Algorithm Among the Multi-layer Perceptron Algorithm," International Journal of Computer Science and Network Security, vol. 9, pp. 378-383, 2009.

[65]. M. Sharma, G. Purohit, and S. Mukherjee, "Information Retrieves from Brain MRI Images for Tumor Detection Using Hybrid Technique K-means and Artificial Neural Network (KMANN)," in Networking Communication and Data Knowledge Engineering, ed: Springer, 2018, pp. 145-157.

[66]. Y. Gao, X. Li, M. Dong, and H.-p. Li, "An enhanced artificial bee colony optimizer and its

application to multi-level threshold image segmentation," Journal of Central South University, vol. 25, pp. 107-120, 2018.

[67]. M. K. Alsmadi, "A hybrid firefly algorithm with fuzzy-C mean algorithm for MRI brain segmentation," American Journal of Applied Sciences, vol. 11, pp. 1676-1691, 2014.

[68]. M. K. Alsmadi, "MRI brain segmentation using a hybrid artificial bee colony algorithm with fuzzy-c mean algorithm," Journal of Applied Sciences, vol. 15, p. 100, 2015.

[69]. M. K. Alsmadi, "A hybrid Fuzzy C-Means and Neutrosophic for jaw lesions segmentation," Ain Shams Engineering Journal, 2017.

[70]. S. H. Park and K. Han, "Methodologic Guide for Evaluating Clinical Performance and Effect of Artificial Intelligence Technology for Medical Diagnosis and Prediction," Radiology, p. 171920, 2018.

[71]. D. S. Kermany, M. Goldbaum, W. Cai, C. C. Valentim, H. Liang, S. L. Baxter, A. McKeown, G. Yang, X. Wu, and F. Yan, "Identifying Medical Diagnoses and Treatable Diseases by Image-Based Deep Learning," Cell, vol. 172, pp. 1122-1131. e9, 2018.

[72]. I. Almarashdeh, "Sharing instructors experience of learning management system: A technology perspective of user satisfaction in distance learning course," Computers in Human Behavior, vol. 63, pp. 249-255, 2016.

[73]. I. ALMARASHDEH, H. BOUZKRAOUI, A. AZOUAOUI, H. YOUSSEF, L. NIHARMINE, A. A. RAHMAN, S. S. S. YAHAYA, A. M. A. ATTA, D. A. EGBE, and B. M. MURIMO, "AN OVERVIEW OF TECHNOLOGY EVOLUTION: INVESTIGATING THE FACTORS INFLUENCING NON-BITCOINS USERS TO ADOPT BITCOINS AS ONLINE PAYMENT TRANSACTION METHOD," Journal of Theoretical and Applied Information Technology, vol. 96, 2018.

[74]. I. Almarashdeh, "The important of service quality and the trust in technology on users perspectives to continues use of mobile services," Journal of Theoretical & Applied Information Technology, vol. 96, 2018.

[75]. I. Almarashdeh and M. Alsmadi, "Investigating the acceptance of technology in distance learning program," in Information Science and Communications Technologies (ICISCT), International Conference on, Tashkent Uzbekistan 2016, pp. 1-5.

[76]. I. Almarashdeh and M. Alsmadi, "Heuristic evaluation of mobile government portal services: An experts' review," in 11th International Conference for Internet Technology and Secured Transactions (ICITST), 2016, pp. 427-431.

[77]. I. Almarashdeh and M. K. Alsmadi, "How to make them use it? Citizens acceptance of M-government," Applied Computing and Informatics, vol. 13, pp. 194-199, 2017/07/01/ 2017.

[78]. I. Almarashdeh and M. K. Alsmadi, "Applied Computing and Informatics," 2017.

[79]. I. Almarashdeh, A. Althunibat, and N. F. Elias, "Developing a Mobile Portal Prototype for E-government Services," Journal of Applied Sciences, vol. 14, pp. 791-797, 2014.

[80]. I. Almarashdeh, A. Althunibat, N. Fazidah Elias, A. Adewumi, A. Al Thunibat, N. Zin, N. Ashaari, A. Al Thunibat, N. Zin, and N. Sahari, "E-Government for mobile societies-stocktaking of current trends and initiatives," Journal of Applied Sciences, vol. 14, pp. 104-111, 2013.

[81]. I. Almarashdeh, N. F. Elias, N. Sahari, and N. Zain, "Development of an interactive learning management system for malaysian distance

learning institutions," Middle East Journal of Scientific Research, vol. 14, pp. 1471-1479, 2013.

[82]. I. AlMarashdeh, G. M. Jaradat, M. Ayob, A. Abu-Al-Aish, and M. Alsmadi, "An Elite Pool-Based Big Bang-Big Crunch Metaheuristic for Data Clustering," Journal of Computer Science, 2018.

[83]. I. Almarashdeh, N. Sahari, and N. Mat Zin, "Heuristic evaluation of distance learning management system interface," presented at the International Conference on Electrical Engineering and Informatics Bandung, Indonesia 2011.

[84]. I. Almarashdeh, N. Sahari, N. M. Zin, and M. Alsmadi, "Instructors acceptance of Distance Learning Management System," in International Symposium on Information Technology 2010 (ITSim 2010), Kuala Lumpur, 2010, pp. 1-6.

[85]. I. A. Almarashdeh, N. Sahari, N. A. H. M. Zin, and M. Alsmadi, "Distance learners acceptance of learning management system," in 2nd International Conference on Data Mining and Intelligent Information Technology Applications (ICMIA2010), Seoul, Korea, 2010, pp. 304-309.

[86]. I. A. Almarashdeh, N. Sahari, N. A. H. M. Zin, and M. Alsmadi, "Distance Learning Management System requirements From Student's Perspective," The international Journal of Theoretical and Applied Information Technology, vol. 24, 2011.

[87]. I. A. Almarashdeh, N. Sahari, and N. A. M. Zin, "Heuristic evaluation of distance learning management system interface," in Electrical Engineering and Informatics (ICEEI), 2011 International Conference on, 2011, pp. 1-6.

[88]. I. A. Almarashdeh, N. Sahari, N. a. M. Zin, and M. Alsmad, "The Success of Learning Management System Among Distance Learners in Malaysian Universitie," Journal of Theoretical and Applied Information Technology, vol. 21 pp. 80-91, 2010.

[89]. I. A. Almarashdeh, N. Sahari, N. A. M. Zin, and M. Alsmadi, "THE SUCCESS OF LEARNING MANAGEMENT SYSTEM AMONG DISTANCE LEARNERS IN MALAYSIAN UNIVERSITIES," Journal of Theoretical & Applied Information Technology, vol. 21, 2010.

[90]. I. A. Almarashdeh, N. Sahari, N. A. M. Zin, and M. Alsmadi, "Acceptance of learning management system: A comparison between distance learners and instructors," Advances in Information Sciences and Service Sciences, vol. 3, pp. 1-9, 2011.

[91]. I. A. E. Almarashdeh, "Study of the Usability of Learning Management System Tool (Learning Care) of Postgraduate Students in University Utara Malaysia (UUM)," Graduate School, Universiti Utara Malaysia, 2007.

[92]. I. A. Almrashdah, N. Sahari, N. A. H. M. Zin, and M. Alsmadi, "Distance learners acceptance of learning management system," in Advanced Information Management and Service (IMS), 2010 6th International Conference on, 2010, pp. 304-309.

[93]. I. A. Almrashdah, N. Sahari, N. A. H. M. Zin, and M. Alsmadi, "Instructors acceptance of distance learning management system," in Information Technology (ITSim), 2010 International Symposium in, 2010, pp. 1-6.

[94]. I. A. ALMRASHDEH, N. SAHARI, N. A. M. ZIN, and M. ALSMADI, "DISTANCE LEARNING MANAGEMENT SYSTEM REQIUREMENTS FROM STUDENT'S PERSPECTIVE," Journal of Theoretical & Applied Information Technology, vol. 24, 2011.

[95]. I. A. Almrashdeh, N. Sahari, N. A. M. Zin, and M. Alsmadi, "Instructor's success measures of

Learning Management System," in Electrical Engineering and Informatics (ICEEI), 2011 International Conference on, 2011, pp. 1-7.

[96]. M. K. A. Ibrahim Almarashdeh, Ghaith Jaradat, Ahmad Althunibat, Sami Abdullah Albahussain, Yousef Qawqzeh, Usama A Badawi, Tamer Farag, "Looking Inside and Outside the System: Examining the Factors Influencing Distance Learners Satisfaction in Learning Management System," Journal of Computer Science, vol. 14, pp. 453-465, 2018.

[97]. G. Jaradat, M. Ayob, and I. Almarashdeh, "The effect of elite pool in hybrid population-based meta-heuristics for solving combinatorial optimization problems," Applied Soft Computing, vol. 44, pp. 45-56, 2016.

[98]. M. Rasmi, M. B. Alazzam, M. K. Alsmadi, I. A. Almarashdeh, R. A. Alkhasawneh, and S. Alsmadi, "Healthcare professionals' acceptance Electronic Health Records system: Critical literature review (Jordan case study)," International Journal of Healthcare Management, pp. 1-13, 2018.

[99]. J. Adeyemo, O. Oyebode, and D. Stretch, "River Flow Forecasting Using an Improved Artificial Neural Network," in EVOLVE-A Bridge between Probability, Set Oriented Numerics, and Evolutionary Computation VI, ed: Springer, 2018, pp. 179-193.

[100]. A. Ahani, M. Shourian, and P. R. Rad, "Performance Assessment of the Linear, Nonlinear and Nonparametric Data Driven Models in River Flow Forecasting," Water Resources Management, pp. 1-17, 2018.

[101]. "Global Banking & Finance Review® is a leading financial portal and Print Magazine offering News, Analysis, Opinion, Reviews, Interviews & Videos from the world of Banking, Finance, Business, Trading, Technology, Investing, Brokerage, Foreign Exchange, Tax & Legal, Islamic Finance, Asset & Wealth Management. Copyright © 2010-2019 GBAF Publications Ltd - All Rights Reserved.."

[102]. giesecke, Devrient, and bundesdruckerei, "Biometrics," Veridos, vol. https://www.veridos.com/files/assets/images/Topics%20&%20Trends/Veridos%20Biometrics%20White%20Paper%20Download.pdf, 2018.

[103]. F. J. Zareen, K. A. Shakil, M. Alam, and S. Jabin, "BAMCloud: A Cloud Based Mobile Biometric Authentication Framework," arXiv preprint arXiv:1601.02781, 2016.

[104]. Mada, "How mada works," https://www.mada.com.sa/en/services, 2019.

[105]. TheSaudiInvestmentBank, "Mobile Point of Sales (mPOS)," https://www.saib.com.sa/en/mpos, 2019.

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International Response to Climate Change : A Review

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ABSTRACT

Climate change includes the changes in temperature, precipitation, wind patterns as well as other environmental factors. Climate change has always been there but the process has been accelerated so catastrophically due to human activities that now it is nearly impossible to reverse its impacts on the environment. International treaties have joined hands long back to combat climate change, there are a number of policies introduced worldwide to reduce greenhouse gas emissions, promote cleaner productions and sustainable development. Climate change is also addressed globally by the United Nations Framework Convention on Climate Change (UNFCCC). This paper focuses on the mitigation steps and policies implemented by different countries under United Nations Intergovernmental Panel on Climate Change (IPCC).

Keywords : Climate Change, International Treaties, Mitigation, Sustainable Development, Cleaner Productions, United Nations, Policies.

I. INTRODUCTION

Since 1990, climate change has demonstrated the effects of financial operations. Increasing industrialization, urbanization and development has led to massive emissions of greenhouse gas, leading to climate change which is already threatening development in poor and climate-changing countries. If there's no checking, it could lead to drastic changes in climate seen by future generations and the fluctuations maybe very rarely seen in millions of years. Emission levels continued to increase, despite policies and legal actions taken in various countries, only since 2006, following publication of Stern Climate Change Economics Review. One reason for that has been the reaction of a clique of economists to the concerns and calls for action by climate researchers since the publishing of the first IPCC report in 1990. The answer was the misapplication of an instrument for prescriptive strategy created by equilibrium economists: the cost-benefit assessment. This article discusses the issue of how and why the focus of climate change economy shift from the single discipline cost-effectiveness analysis as shown by the 1995 IPCC Second Assessment Report to the subsequent IPCC 2001 and 2007 multidisciplinary unsafe assessment and radically distinct policy requirements for the 2006 Stern Review.

Applying the traditional cost-benefit analysis, with certain exceptions, has produced policy requirements for insignificant carbon taxes and postponed actions until further data on the issue is accessible and R&D is performed to reduce the cost of any reaction. The fresh mainstream uncertainty analysis, however, indicates that a worldwide political choice on objectives to prevent dangerous climate change should be made as a matter of urgency, while cost-effective and equitable policies and measures should be put in place immediately and strongly to speed up progress towards full worldwide economic decarbonisation. A social and political job is to define

hazardous in this context. Implicit progress has been made towards the 2 ° C target of the European governments for average worldwide long-term temperatures above pre-industrial concentrations, the G8 50 per cent reduction of worldwide GHG emissions below 1990 concentrations by 2050 in line with the June of 2007 conference in Heiligendamm, Germany and the "profound cuts" in UNFCCC Bali's December 2007 action plan. The summary for policymakers for AR4 WG3 indicates the depth of the reductions. It shows six literature scenarios on the necessary scale. For a possibility to be below 50:50, models indicate that worldwide CO2 emissions should be 50 to 85% below the level of 2000 by 2050 and that they will be harmful (by sequestration and retention) by 2070. Therefore, the world should strive for complete decarbonisation by 2050 or earlier, if dangerous climate change is to be prevented, defined as a 2 ° C or lower increase. All industries in every single country should aim to prevent the atmosphere from emitting GHGs at the earliest feasible price. The AR4 WG2 Summary offers "excellence" trust in extensive mortality of coral reefs without urging intervention and appears to be important in hazards of loss of coral reefs and intact tropical rainforests.

II. METHODS AND MATERIAL

Climate change agreements across the globe

According to the IPCC, worldwide warming must be kept below 2 ° C, methane and other greenhouse gasses must be reduced in order to solve worldwide warming and decrease pollution by a quarter as opposed to 1990 and up to 2050, to decrease global warming by 2025. The countries in global terms unite in the fight against climate change with the Stockholm Declaration, the Rio Declaration, the Kyoto Protocol, the Montreal Protocol and the Paris Agreement. Global conventions and meetings such as Globally have been implemented by policymakers in their respective nations to remedy the damage already caused to an ecosystem.

2.1 United Nations Conference on the Human Environment (Stockholm, 1972)

In 1968-1969, the General Assembly adopted resolutions 2398 (XXIII) and 2581 (XXIV), which were designed to encourage and guide the world-wide conference in Stockholm, in 1972. "Preventing and protecting the human environment" (Resolution 2581 (XXIV) of the General Assembly: "The General Assembly, in 1972, decided to convene a Global Conference in Stockholm in order to act as a practical tool for promoting and providing guidance, in 1968-69, in Resolution 2398 (XXIII) and 2581 (XXIV)." In 1972. Protecting and improving the human environment and preventing its impairment "(Resolution 2581 (XXVI) of the General Assembly.[31] Stockholm has been a first study of the global human impact on the ecosystem to build a fundamental common perspective of how the task of preserving and enhancing the human environment can be tackled. The Stockholm Declaration therefore mainly includes broad environmental policy objectives and objectives, rather than full normative positions. However, after Stockholm, there has been a dramatic increase in worldwide knowledge of environmental issues, as has adequate international environmental legislation. At the same moment, international environmental activism's focus on media-specific and cross-sectoral regulation and the synthesis of financial and growth factors in environmental decision-making has gradually extended beyond transboundary and global commons problems. The international community thus faced the challenge of systematizing and restoring current environmental normative standards, as well as the courageous posing

of legal and political foundations for sustainable development at the time of the Rio Conference. In this vein, UNCED was expected to draw up the "earth charter," a solemn declaration on legal rights and obligations concerning the environment, as part of the 1982 UN General Assembly World Nature Charter (General Assembly Resolution 37/7). Although the consensus text that arose at Rio was not the initially envisaged lofty paper, the Rio Declaration, which reaffirms and builds on the Stockholm Declaration, has nevertheless demonstrated to be a significant economic legal landmark.[31]

This meeting lifted consciousness of a hitherto little talked about problem from a generation, the worldwide environment. The Stockholm Conference has unified the environment worldwide and helped establish the United Nations Environment Program (UNEP). The meeting and its aftermath produced the global nature of the atmosphere recognized and brought the concept of the development-environment partnership. It has been said that the only way to join the world's nations is to confront a common foe; perhaps that obstacle will be environmental degradation. [33]

2.1.1 Implementation of the Stockholm Declaration

Implementing the treaty at all stages of the population (municipal, national, national) is a great chance to promote improvements in economic, occupational, government health and food strategies. But there are huge difficulties.

Although some nations were originally unwilling to agree, the treaty was lastly developed as a vibrant legal tool; for example, it provides for potential inclusion of fresh drugs with POP features. A precautionary' strategy' is also introduced in Annexes A, B or C to cover additional POPs. Calls for the inclusion of polybrominated biphenyls (PBBs), hexachlorocyclohexanes, hexabromobiphenyl and PAHs in the treatise, amongst others, were issued. In order to take effective action, developed countries will have to provide financing and technical support in the least developed countries.[41]

The European Commission appears committed to supporting transforming markets with technical and economic support for emerging countries and nations. In order to reduce use and dispersion of POPs to China, Canada has developed a contribution of $200,000. DDT is still produced by China and India. The pace with which they will implement it is unsure, even if they ratify the Treaty. Note also the need to develop a national implementation plan (NIP) for each Party to the Stockholm Convention describing the way it fulfils the contract's obligations. The authorities need to develop NIPs within two years of their entry into force. The NIP should provide a framework for the systematic and participatory implementation of main policy and regulatory reform, capability building and investment programmes.

Developing nations and nations with transitional economies are qualified for NIP execution capacity building assistance. The Global Environment Facility provides funding for these projects. In order to strengthen the domestic ability to handle POPs and to implement the Convention, the GEF has laid out certain rules for activities which permit the Stockholm Convention and has endorsed the project "Developing National Implementation Plans for POP Management."[41]

2.2 The Montreal Protocol (1987)

The main cause of depletion of ozone layer has now been recognized in the world as chlorofluorocarbons (CFCs) and other ozone-depleting substrates (ODSs). Molina and Rowland6 first acknowledged the opportunity for stratospheric ozone depletion by CFCs in 1974, thus giving an'' early warning'' This science alert resulted in decreases in ODS emissions through citizen action and domestic laws[7 8]. A decade later it became more worrying to find the ozone holes over Antarctica9 and the subsequent distribution to ODSs10. ODSs ' significant threat to the ozone layer was formally recognized by the Montreal Protocol of 1987 and provided a structure to reduce and progressively eliminate the global production and consumption of ODSs. Significant reductions in the manufacturing, use, emissions, and atmospheric levels ofCFC-11, CFC-113, methyl chloroform, and several other ODSs[4,2,3,5] have happened under the Montreal Protocol and domestic laws, and proof for regeneration of stratospheric ozone[4,18] has emerged. In a'' universe prevented'' lacking the early alert in 1974 and the 1987 Montreal Protocol, the ozone layer's depletion would probably be much higher than it has been experienced in today's globe. ODSs and their replacement fluorocarbons are also green-house gasses[19–24], contributing to environmental radiative pressure (RF). Actions to phase out ODSs and/or boost the use of replacement gasses under the Montreal Protocol thus have implications for climate forcing. Previous studies have recognized that continuing growth of the ODS emissions will lead to significant increases in instant radiation or climate warming19-22,24-27, even if the depletion of ODS ozone is counteracting forcing28. In particular, reductions in the ODS level in the atmosphere also assist to preserve the climate in order to protect ozone. This dual protection of ozone and climate under the Montreal Protocol requires a thorough assessment, especially as the 1997 Kyoto Protocol29 of the UN Framework Convention on Climate Change entered into force in February 2005.[1]

2.2.1 Implementation of the Montreal Protocol

By the end of this millennium, the ozone layer is anticipated to rebuild as the Montreal Protocol goes into full and permanent application. Without this Treaty, the deployment of ozone would have increased tenfold in comparison to current levels, leading to million additional cases of melanoma, additional cancers and eye cataracts by 2050. An estimated 2,000,000 people are saved from skin cancer every year by 2030 under the Montreal Protocol.

To date, the Protocol Party's 1990 levels have phased out 98 percent of ODS globally. Because most such products are strong greenhouse gasses, an important contribution to the protection of the global climate system is also made in the Montreal Protocol. Between 1990 and 2010, the treaty control regulations plan to have 135 gigatons of CO2, or a total of 11 gigatons an annual amount, reduced greenhouse gas pollution.

According to Kigali's amendment, HFC-restrictive emissions are expected to be reduced under the Montreal protocol in the form of greenhouse-gas-equal exports of up to 105 million tonnes of coal dioxide, thus contributing to prevent global temperature rises of up to 0.5% Celsius in 2100. The Montreal Protocol is also a major contributor to the UN Sustainable Development Goals.

Due to all these factors and more, the Montreal Protocol is considered to be one of the most efficient environmental agreements of all times. The protocol's

achievements since 1987 are unparalleled and remain an inspiring example of the achievements of worldwide co-operation.[42]

2.3 United Nations Conference on the Environment and Development (UNCED) (Rio de Janeiro, 1992)

On the 20th anniversary of the Stockholm Conference on Human Environment, officials from 178 countries, non-governmental organizations (NGOs) and other stakeholders (about 30,000 in total including press participants) gathered in Rio de Janeiro to address worldwide environmental issues that would become essential to policy execution. The meeting attempted consensus on concrete policies to balance financial activity with planet security to guarantee a sustainable future for all individuals.[37] The first UN Environment and Development Conference – short UNCED, but better known as the "Earth Summit" after three days – marked the culmination of two-and-a-half years of world collaboration showing the most responsible plans for human life. [38]

The United Nations Conference on Environment and Development (UNCED) was held in Rio de Janeiro from 3-14 June 1992. This meeting focused on the state of the worldwide climate and the connection in a political sense between economics, science and the environment. The meeting ended with the Earth Summit, which brought together representatives from 105 countries to show their dedication to sustainable development.[33]

Several global environmental agreements have existed since the 1972 convention, a range of which have been approved by Canada. These include the Great Lakes Water Quality Agreement of 1978; the Geneva Long Range Transboundary Air Pollution Convention of 1979; the Helsinki Agreement of 1985 (a 21-nation undertaking to decrease sulphur dioxide pollution); the Montreal Protocol on Substances Depleting the Ozone Layer of 1988; and the Basel Convention on Transboundary Movements of Hazardous Wastes of 1989.

Over 130 nations ratified the UNCED Convention on Climate Change and the Convention on Biodiversity. Delegates also agreed on Agenda 21, an action plan to grow the earth in a sustained way through the 21st millennium and an extensive declaration of the values for forest safety.[35] The Rio Declaration was recognized without amendment, by all the countries current, as a non-binding declaration of wide environmental policy values. New global networks for implementing and supervising contract execution have been formed, both officially and casually.

Ultimately, the UNCED discussions were in money. The industrialized nations have it and from emerging countries they want it. If the industrialized countries want environmental safety, they have to be ready to pay for it. The conflicts between wealthy and poor and the financial differences behind them were at the heart of every important debate.[36]

2.3.1 Implementation of United Nations Conference on Environment and Development (UNCED)

The Rio Conference gave prominence on the political agenda to environmental issues. It spelled out the questions, even though it did not have all the answers and informed about the issues a whole generation of policymakers, government officials, industry and the people. It also repeated the call for global collaboration on environmental issues first heard in 1972.

Agenda 21 is the next century's environmental action plan. It is not legally binding, but is the foundation

for a fresh global relationship for global sustainable development and preservation of the environment.

Agenda 21 was the main general paper that came out of Rio and was designed to address some of the basic resource degradation and development aid issues. It discusses many problems relating to worldwide sustainability and contains key sections linked to funding, technology transfer execution and organizational follow-up to UNCED.[39] The primary objective of Agenda 21 is to guarantee that growth continues in a viable way: "The scheme of rewards and penalties that motivate economic behaviour must be reoriented to become a stron.[40] Another objective is eventually to eliminate poverty worldwide by improving energy and natural resource management and improving the quality of lives by securing access to housing and clean water, wastewater and strong waste therapy. Agenda 21 also seeks sustainable use of global and regional resources such as atmospheres, oceans, seas and freshwater, and marine organisms. The ultimate objective is to improve chemical and waste management. It is projected that one-third of third world fatalities are triggered by human or industrial waste contaminated meat and water.

Although UNCED's 154 involved states ' agreed terms are well represented in the five main contracts, individual states ' positions are not. The five most important UNCED nations could sum up their behaviour as follows: Canada, "do it;" USA, "delay it;" Germany, "control it;" Japan, "fix it;" and India, "sell it."

Canada took part in all the debates, pledged to rapidly ratify the conferences, and made a real attempt to make the Earth Summit a success. In recent years, Canada has implemented numerous initiatives to support its commitment to the environment, such as the National Round Table on the Environment and Economy, the Environmental Choice Program and the National Packaging Protocol. The Green Plan launched in 1990 is a major commitment to Canada. It sets out goals and plans for a variety of operations, similar in spirit to Agenda 21.

2.4 The Kyoto Protocol (1997):

Kyoto is a global arrangement to reduce emissions of carbon dioxide, CO2, the largest greenhouse gas emissions and five other compounds, none of which is ODS. The fact that the Kyoto Protocol does not contain ODSs and that the Montreal Protocol has no formal climate variables provides reason to consider prior and new ODS emission scenarios and their substitution, as well as their importance to the anthropological RF. The entry into force of the Kyoto Protocol on 16 February 2005 was a result of international climate change concerns. This comprises legally binding emission targets for industrialized countries to be achieved during 2008-2012 (the so-called Kyoto commitment period). The proponents of the protocol greeted this as a breakthrough in global climate strategy as they committed important emission reductions to developed world commercial-as-usual emissions under the original rules and (ii) created a comprehensive worldwide structure for further expansion and further climate protection activities[15]. The Protocol sets obligatory GHG emission targets that can be enforced. Initial emission reductions for involved countries ranged from-8 to+ 10 percent of the 1990 prices, whereas the overall reduction goal was 5 percent below that of 1990 from 2008 to 201211. At the time of the first engagement in 2012, the Protocol has been modified for a second commitment period; the new overall target for a decline of 18% was below 1990 levels by 2020.[12] Three procedures for decreasing GM emissions are the focus of the Protocol, namely Joint

Implementation (JI), the Clean Development Mechanism (CDM) and the ITC.[12]

2.4.1 Implementation of the Kyoto Protocol

The United Nations Framework Convention on Climate Change (UNFCCC) Kyoto Protocol entered into effect on 16 February 2005. In the original engagement era from 2008 to 2012, the 37 most industrialized countries of the 146 nations ratifying the agreement decided to decrease their GHG emissions below 1990 rates. At the Buenos Aires Conference of the Parties in December 2004, negotiators produced little progress towards consensus on post-2012 guidelines. While big developing countries like China, India, and Brazil are emitting significant and rising quantities of worldwide GHGs, emerging nations do not presently have a duty to decrease emissions. During the last three Conferences of the Parties to the Climate Convention (COPs 8, 9 and 10), the problem of developing nation obligations was already controversial. The continuity of the Kyoto Protocol after 2012 may rely on the consensus reached on this problem between Annex I and emerging nations. Annex I countries are permitted to achieve certain emission reductions by investing in energy and tree planting projects (reforestation and forestation) through the "Clean Development Mechanism" to reduce GHG emissions in developing countries. But countries that are experiencing or at danger of large-scale deforestation, like Brazil, Indonesia, Bolivia, Peru, Columbia, and Central African nations, have no motivation to decrease or prevent deforestation emissions. There is a definite need for significant rewards for developing. ping nations to engage meaningfully in the near-term reduction of emissions while maintaining the guiding principle of "common but distinguished obligations" of the UNFCCC.[31]

Following years of inability to achieve global agreement on an action strategy to substitute the Kyoto pact, United Nations. Negotiators decided four years earlier in Paris that all countries would function to maintain this century's global temperature "well below" 2 degrees Celsius above pre-industrial concentrations and to create severe attempts to maintain it rising to just 1.5 degrees.

In particular, further financing has been promised to reduce emissions to emerging nations, and new structures have chosen to report emissions and mitigation measures for national However, President Donald Trump deleted his country, which 170 countries have since endorsed, including all major developed and economic emergent, from the Paris Agreement, leaving America the only major polluter to choose. greenhouse gases. President Donald Trump, however, removed his nation from the Paris Agreement, which has since been approved by 170 nations, including all the main advanced and emerging economies, leaving the United States as the only significant polluter to opt out.

The United States before Kyoto. Congress warned that, unless an accord was reached to force obligations to developing nations such as China and India, America would not ratify the Kyoto Protocol. The accord was scarcely reached when U.S. Congressional representatives in Kyoto, who had resisted it said it would never float. U.S. gas and petroleum lobbies pressure to scrutinize the treaty was strong in advance and announced America's withdrawal in 2001 when George W. Bush became President.

For the other nations in February 2005 the Kyoto Protocol came into effect. Tentative attempts at reaching another arrangement including emerging nations, in particular between the US and a fast-

growing China, started to create conflict. At the end of 2012 of the first phase of the Kyoto Protocol, Doha decided to extend the duration to 2020. However, only 88 of the initial Kyoto signatories approved the Doha amendment as early as last months, which would maintain its decrease objectives for the Kyoto Protocol by 2020. At least 144 states in the Kyoto Protocol are required to make the amendment.[30]

2.5 The Paris Agreement (2015)

The UNFCCC Agreement to maintain global temperatures below 2 ° C above pre-industrial concentrations achieved in December 2015 to a mitigation agreement on climate protection, called the Paris agreement. The agreement will be enforced 30 days after 55 countries have ratified the Treaty. The 55 countries must account for at least 55% of the world's emitions.13 On 4 November 2016, the Paris Agreement entered into force. There were 197 signatories to the Paris Convention as of 24 July 2018, of which 179 joined the statement representing 55% of global exports.[14]

The Paris Agreement builds on the Convention and for the first time brings all nations into common support with greater assistance to assist the developing countries to make ambitious efforts to combat and adapt to climate change. A new path in the global climate effort has therefore been identified. By keeping the global temperature well below 2 ° C above pre-industrial concentrations in this Millionth anniversary and by attempting to further reduce the temperature increase to 1.5 ° C, the Paris Agreement mainly aims at reinforcing the global response to the danger of climate change. Furthermore, the agreement seeks to increase the ability of countries to deal with the impacts of climate change. To accomplish those ambitious targets, appropriate flows will be put into practice in order to foster action among emerging nations and the most vulnerable countries in line with their own internal objectives. In addition, an enhanced capacity building system will be established. The Agreement also provides for enhanced action transparency and a sounder transparency framework.

2.5.1 Implementation of the Paris Agreement

The Paris Accord came into force on 12 December 2015 at its 21st session, held in Paris from 30 November 2015 to 13 December 2015, of the Conference of the Parties to the United Nations Framework Convention on Climate Control. The agreement may be authorized by States and domestic economic integration organizations Parties to the United Nations Framework Convention on Climate Change in compliance with Article 20 at its United Nations Headquarters in New York from 22 April 2016 to 21 April 2017.

In accordance with the Paris Convention Japan promised to cut emissions by 26% below the 2013 levels by 2030, which climate experts have criticized as insufficient to keep global temperature rises below 2° C. Under the Paris Convention, by 2030 Japan has pledged to reduce its emissions to 26 percent below 2013, which climate scientists have criticized as being insufficient to maintain a below 2-degree increase in global temperature. Ministry of the Environment figures show that Japan's full greenhouse gas revenues fell by 2.9% in fiscal 2015 and by 6% in 2013 in Paris, but still were about 4 percent higher than the founding year of the Kyoto Protocol in 1990.[30]

III. RESULTS AND DISCUSSION

Politicians across the globe have come up with fresh concepts and opportunities to solve the impacts of

climate change after various statements and meetings. New policies were created and the ancient policies modified in order to further reduce climate change and its adverse effects on the environment.

With regard to the baseline scenario, fresh models were created for the future ODS regulation as the Montreal Protocol recognizes the importance of improving its dual ozone and climatic benefit. The parties first considered this in 1999 when the Kyoto Protocol was enacted, but it was not yet in effect. During international meetings and decision-making, the Parties to the Montreal Protocol have seen options to further reduce ozone depletion while reducing environmental stress incidentally. Some important cases include:(i) continue to develop the phase-out of HCFC and use of low GWP substitution; (ii) Collection and disposal of old cooling, air conditioning and heat insulation material materials discovered in antique cooling banks; and (iii) Assessment of the technical and financial feasibility of further overall reduction of ODS pollution. Emission reductions in compounds, such as CFC and HCFCs, with reducing emissions or expected phase-outs in the next several decades, are generally less effective than those with increasing concentrations of emissions or enhanced emissions.

The adoption of such an instrument under the Protocol would encourage policy-making in developing countries to monitor deforestation and allow tropical countries to take an important role in preventing dangerous climate interaction. The progress towards emission goals has been mixed since the entry into force of the Paris Accord. The Chinese authorities announced their outstanding advancement in reducing emissions of greenhouse gasses and said that China had met its commitments in 2017 for 2020. In 2018, the EU officials, for example, reported that all Member States have fallen behind when it came to attaining their targets ; Sweden, Portugal and France have taken the most steps by 2018, attaining 77%, 66% and 65%, respectively, of the 2020 objectives. U.S. advances were less evident. Some surveys found that changes to U.S. climate policies impeded the country from attaining its climate goals, while others claimed that higher greenhouse gas legislation was being introduced in many of the U.S. cities and nations that allowed the country as a whole to remain on track. Despite these research, several worldwide research agencies have noticed ongoing increases in coal emissions. The Rhodium Group reported a 3,4% rise in US emissions in 2018, with a 1.6% rise in global coal dioxide, primarily flat, between 2014 and 2016, and a 2.7% rise in 2017 and 2018 respectively.

IV. CONCLUSION

The concept of sustainability has been modified for greener and cleaner Earth by many nations. Scientists worldwide have worked jointly to enforce these international treaties and their agreements to lower their country's emissions. Such agreements and conventions definitely led countries to acknowledge environmental problems, address areas and mitigate initiatives in the direction of a greater future for the planet and its community together with their people.

The future of Kyoto is indefinite, but the global climatic change has no bearing on tropical deforestation. There is still time for scientists and policy-makers to exploit what definitely is one of the greatest opportunities for global carbon trading today to safeguard tropical forests before the benefit of the Kyoto Protocol rises in burn. There may be international conferences, but preventive measures are the step every country wishes to take because evasion is always larger than remedial action.

V. REFERENCES

[1]. The importance of the Montreal Protocol in protecting climate, Guus J. M. Velders, Stephen O. Andersen, John S. Daniel, David W. Fahey, and Mack McFarland

[2]. Rowland FS (2006) Philos Trans R Soc London B 361.

[3]. United Nations Environment Programme (2005) Production and Consumption of Ozone Depleting Substances under the Montreal Protocol 1986–2004 (Ozone Secretariat, United Nations Environment Programme, Nairobi, Kenya).

[4]. World Meteorological Organization Global Ozone Research and Monitoring Project (2007) Scientific Assessment of Ozone Depletion: 2006 (World Meteorological Organization, Geneva), Report 50.

[5]. Solomon S (2004) Nature 427.

[6]. Molina MJ, Rowland FS (1974) Nature 249.

[7]. Andersen SO, Sarma KM (2002) Protecting the Ozone layer: The United Nations History (Earthscan, London).

[8]. United Nations Environment Program (2003) Handbook for the International Treaties for the Protection of the Ozone Layer (Ozone Secretariat, United Nations Environment Program, Nairobi, Kenya).

[9]. Farman JC, Gardiner BG, Shanklin JD (1985) Nature 315.

[10]. Solomon S, Garcia RR, Rowland FS, Wuebbles DJ (1986) Nature 321.

[11]. United Nations Framework Convention on Climate Change (UNFCCC) (2007) "Kyoto Protocol."

[12]. UNFCCC (2013) "Kyoto Protocol."

[13]. UNFCCC (2016) Summary of the Paris Agreement.

[14]. UNFCCC (2018) "Paris Agreement-Status of Ratification."

[15]. McKibbin, W.J. and P.J. Wilcoxen (2002), 'The Role of Economics in Climate Change Policy', Journal of Economic Perspectives 16(2).

[16]. Stern Review of the economics of climate change in 2006.

[17]. World Meteorological Organization Global Ozone Research and Monitoring Project (1988) Report of the International Ozone Trends Panel (World Meteorological Organization, Geneva), Report 18.

[18]. Newchurch MJ, Yang E-S, Cunnold DM, Reinsel GC, Zawodny JM, Russell JM, III (2003) J Geophys Res 108.

[19]. Wigley TML (1988) Nature 335.

[20]. Fisher DA, Hales CH, Wang W-C, Ko MKW, Dak Sze N (1990) Nature 344.

[21]. Ko MKW, Dak Sze N, Molnar G (1993) Atmos Environ 27A.

[22]. Solomon S, Daniel JS (1996) Climatic Change 32.

[23]. Intergovernmental Panel on Climate Change (1990) Scientific Assessment of Climate Change—Report of Working Group I (Cambridge Univ Press, Cambridge, UK).

[24]. Hansen J, Lacis A, Prather M (1989) J Geophys Res 94.

[25]. den Elzen MGJ, Swart RJ, Rotmans J (1992) Sci Total Environ 113.

[26]. Kroeze C, Reijnders L (1991) Sci Total Environ 111.

[27]. Ramanathan V (1975) Science 190.

[28]. Intergovernmental Panel on Climate Change (2001) Climate Change 2001: The Scientific Bases: Contribution of Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change (Cambridge Univ Press,Cambridge, UK).

[29]. United Nations Framework Convention on Climate Change (1997) Kyoto Protocol to the United Nations Framework Convention on Climate Change.
[30]. 20 years after Kyoto Protocol, where does world stand on climate? by Eric Johnston.
[31]. Tropical deforestation and climate change / edited by Paulo Moutinho and Stephan Schwartzman. -- Belém - Pará - Brazil : IPAM - Instituto de Pesquisa Ambiental da Amazônia ; Washington DC - USA : Environmental Defense, 2005.
[32]. Declaration of the United Nations Conference on the human Environment (Stockholm Declaration), 1972 and the Rio Declaration on Environment and Development, 1992, By Günther Handl, Eberhard Deutsch Professor of Public International Law, Tulane University Law School
[33]. The Rio Earth Summit: Summary of the United Nations Conference on Environment and Development. Prepared by, Stephanie Meakin, Science and Technology Division. November 1992
[34]. Environment Canada, "Canada and the Earth Summit: Green Plan Goes Global," 1991.
[35]. Bette Hileman, "Earth Summit Concludes with Agenda for Action, but Little Funding," Chemical and Engineering News, 6 July 1992.
[36]. Carla Flamer and Michael Meager, "Post-Earth Summit Analysis: UNCED Implementation, Follow-up Measures Proposed," Eco Log, 7 August 1992.
[37]. "In Our Hands," Earth Summit, U.N. Publication DPI/111 8-40437-May 1991-50M.
[38]. Paul Hanley, "Brazilian City of Curitaba Model of Local Action for Global Survival," The Star Phoenix, 22 June 1992.
[39]. Eco Log, 7 August 1992.
[40]. The United Nations Conference on Environment and Development, "Agenda 21," 1992.
[41]. M Porta, E Zumeta, Implementing the Stockholm Treaty on Persistent Organic Pollutants.
[42]. United Nations Environment Program, Ozone Action Plan report.

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मेघदूत गीतिकाव्ये दाम्पत्यजीवन विविध चित्रम्

सोनिया
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सनातन धर्म महाविद्यालय
मुजफ्फरनगर (उ०प्र०)

महाकवि कालिदासः संस्कृत वाङ्मये अति प्रसिद्धं भासुरं रत्नम्। संस्कृत साहित्ये कालिदासीय ग्रन्थेषु मेघदूतम् इति विप्रलम्भशृंगार प्रधानं गीतिकाव्यम् अस्ति। संस्कृत भाषोपनिषद्धेषु ईदृशस्य काव्यस्य खण्डकाव्यम् च संदेशकाव्यम् इति प्रसिद्धिः। आधुनिक समये गीतिकाव्यम् इदम् उच्यते यतोस्मिन् काव्ये मानव मनसः मनोगतानाम् भावानाम् एवं भ्पसृवम् अनूभूयते। अत्र कुबेरशापेन अस्तङ्गमित महिम्नः कस्यचित। कर्त्तव्य विमुखस्य यक्षस्य विरह व्यथा वर्णनं कृतम्। वैदर्मीरीतिः अर्थान्तरन्यास चमत्कारः, मन्दाक्रान्ता छन्दः, प्रकते मानवीकरणम, उपमाया आस्वादनम्, अलकाया लोकोत्तर वर्णनं, विरहिण्या यक्षिव्या वर्णन, यक्षस्य संदेश इत्यदिनां विविध वर्णनं अस्य ग्रन्थरुप वैशिष्टयानि।

अस्य गीतिकाव्यरुप भाषा अतीव प्राञ्जल, सुमधुरा, प्रसादगुणान्विता च। कल्पना चरमणीया, अद्वितीया, अभिनवा, कोमला वर्ण्यविषयानुकूला च। प्रबन्धेऽस्मिन् एक नारीव्रतस्य यक्षस्य पतिव्रताया यक्षवध्वा विस्तरेण वर्णन कुर्वता। कालिदासेन दम्पत्योः प्रेम प्रति महती निष्ठा यथा प्रकृतीकृता तथा उपस्थापयितुम इष्यते। यक्षयक्षवध्वोः दाम्पत्य प्रेम्णो वर्णनमस्मिन गीतिकाव्ये कविता निपुणतया कृतम्। रामगियीश्रमे स्वितो यक्षः स्वकीयां भार्यां प्रति मेध माध्यमेन संदेश प्रेषयति। अत् भार्याविरहे यक्षा दौ बल्येन अभवत्।

"कनक वलय भ्रंशरिक्त प्रकोष्ठः" (पूर्वमेघ 2)

यदयपि स कामी तु अस्ति, किन्तु तस्य कामोऽपि नापरां कामपि सुन्दरीम् अपि तु स्वकीय भार्यामेव विषयी करोति। दाम्पत्य प्रेम्ण एकाग्रत्वम् एकनिष्ठत्वं चेत्थम् अत् प्रति पाद्यते। स आषाढमासे मेघ दृष्टवा भार्वायाः कृते व्यग्रो भवति।

कवि कालिदासः यक्षस्य विरहावस्यां वर्णयन् कवि कथयति–

"मेधालोके भवति सुजिनौऽप्यन्याथावृत्ति चेतः।

कष्ठाश्लेषप्रणयिनि जने किं पुनर्दूरसंस्थे।।" (पूर्वमेघ–2)

यक्षयक्ष वध्वोः दाम्पत्यप्रेम्णि उत्कण्ठायाः त्यागगस्य तथा च एकात्मभावस्य एव प्राधन्य विध्यते। यद्यपि यक्षवधुः विरहेण कृशतरा सञ्जाता, तथापि सा स्वप्रियतमस्य मंङ्ग्लार्थ देवान् पूजयति।

आलोके ते निपताति पुरा सा बलिव्याकूला वा (उ०मे० 22)

अन्ये अपि स्थाने यक्षे स्व दयितां जीविता लम्बनार्थी हेतवः मेघ समझे स्वकुशलमयी प्रेषितवान्प्रत्यासन्ने नभसि दयिता जीविता लम्पनार्थी जीमूतेन स्वकुशलमयी हारयिष्यन्त्तवृतिम्। सप्रत्यगैः कुटजकुसुमैः कल्पिताधीय तस्यै प्रीतः प्रीतिप्रमुखवचनं स्वागतं व्याजहार।

सा विरहिणी प्रियतमस्य प्रत्यागमनपेक्षमाणा आशाबन्धमवलम्बस्य कश्चिद् दिवसान् यापयेद् इत्यातोऽयं विरही यक्षो मेघं कथयति।

तां चावश्यं दिवस गणनातत्परामेक पत्नी–मण्यापत्नामविध्वगतिर्दक्ष्यसि भ्रातृजायाम्। आशाबन्धः कुसुमसदृशं प्रायशोयङ्ग्नानाम् सदयः पाति प्रणयिह्रदयं विप्रयोगे रूणद्धि। (पूर्वमेघ)

पतिविरह सा केन प्रकारेण रजनीं यापयति इति यक्षुमुखात् ज्ञायते–

नीता रात्रि क्षण इव मया सार्धमिच्छारतैर्या तामेवोष्णैर्विरहमहतीमश्रुभिर्यापयन्तीम्। (उ०मे० 26)

तस्या दुःखं दृष्टवा निर्जीवः मेघ अपि रोदनं करिष्यन्ति–

त्वामप्यस्त्रं नवजलमयं मोचयिष्यलवश्चम्। (उ०मे० 30)

विरही यक्षः तुषाराद्रिवातान आलिङ्ग्ति यतो हि प्रियतमां संस्पृश्य ते आगता इति विचिन्तय–

आलिङ्ग्यन्ते गुणवति मया ते तुषाराद्रिवार्ताः।

पूर्वं स्पृष्टं यदि किल भवेदङ्ग्मेभिस्तवेति।। (उ०मे० 44)

दामपत्यजीवने संयोगश्च वियोग सर्वसमये उपस्थिता। संयोग समये सर्वे वस्तुनः सुखकारी भवति।

काव्यप्रकाशकारः नवम् उल्लासे अनुप्रासउदाहरणे अस्य श्लोक प्रस्तुत कुर्वन्ति। अस्स संयोग, वियोग दशा सम्यक् वर्णनं प्रस्तुतं करोति।

यस्च च सविधे दयिता दवदहन स्तुहिन दीधि तिस्तस्य।

यस्य न सविधे दयिता दवदहन स्तुहिन दीधितिस्तस्य।।

अन्ये अपि स्थाने स्वमं कालिदासेन अभिज्ञानेन शाकुन्तलम नाटकमध्ये विप्रयोग समये नायिका दशा कस्य प्रकारेण भवति वर्णनं करोति।

अर्न्तहिते शशिनि सैव कुमुद्वती मे दृष्टिं व नन्दयति संस्मरणीय शोभा।

इष्टप्रवास जनीतान्यबला जनस्य दुखानि नूनमति मात्र सुदुःख सहानि (4/3)

मेघदूते काव्ये कालिदास्य कथ्यते मानवः वियोग समये व्यवहारशून्य व भवति तेन कारणेन सः चेतन साध्यमर्थ कथमचेतेनेन कारयितुं प्रवृत इत्येपेक्षायां कवि समधते–

धूमज्योति सविलमरुतां संनिपाताः क्व मेघः संदेशार्थाः क्व पटुकरणै प्राणिभिः प्रापणीयाः।
इत्यौत्सुक्यादपरिगणयन्गुहयकस्तं ययाचे कार्मार्त्ता हिं प्रकृतिकृपाणश्चेत नचितनेषु।।

यक्षिणी गुणवति तथा च कल्याणी आसीत्। सा पत्युः कल्याणाम् एव इच्छति। एवमेव यक्षस्व ह्रदयेऽपि स्वकीया भार्यायाः कृते प्रेमातिशयो दृश्यते। प्रथमतो यौवनस्य आवेगरन्तं कर्तव्यच्युतभकरोत्। परन्तु वर्षभोग्य विरहरूपेण प्रायश्चितेन विशोधितः सः अन्तः किमपि परिवृतिं गतः। विरहावस्था एव निकषस्वरुपा यसा परीक्षितः प्रेमिको दाम्पत्यप्रेम्णः पराकाष्ठां प्राप्तोति। यथा कुमारसम्भवे महाकाव्ये, शाकुन्तले नाटके तथा मेघदूतेऽपि एतदेव तत्वं कविना प्रकाशितम्। अत एव सम्भोगाकाक्षा अपि विप्रलम्भगतां वेदनों प्रति अङ्ग्भावमासेवते इति तस्या वस्तुभूताया अपि गौणत्वमेव सूचितम्।

यक्षवधूः यक्षस्य द्वितीयं जीवितमस्ति। पतिविरहे सा चक्रवाकविरहे चक्रबाकीव जीवनं याययति।

तां जानीथाः परिमितकथा जीवितं मे द्वितीयं

दूरीभूते मयि सहचरे चक्रवाकीमिवैकाम्।। (उ०मे० 20)

भार्याप्रेार्म्ण व्यग्रोः यक्षः प्रथमं भार्यायाः कुशलमेव ज्ञातुमिच्छति–

अव्यापन्नः कुशलमबले पृच्छति त्वां वियुक्त

पूर्वाभाष्यं सुलभविपदां प्राणिनामेतदेवः।। (उ०मे० 38)

प्रकृत्यां भार्यायाः सादृश्यमप्राप्य सः पक्षः शिलायां धातु रागैः भायीयाः प्रणयकुपितामाकृतिं रचयति। किन्तु तथा कुर्वतः अपि तस्य नेत्रयोः अश्रुप्रवाहो निरसरति। येन स आलेख्यहारेणापि प्रियया सह मेलनं प्रातुमसमर्थो भवति। सस्वपनेऽपि भार्पालिङ्गनकामनया स्वबाहू प्रसारयति। भर्याया कृते तस्य दुःखातिश्यं, व्यग्रतां च पश्यन्त्यो वनदेव्यः अपि रुदन्ति। यक्षो भार्याधमेव जीवति, तथा च प्रियामपि धैर्य धारणाय उपदिश्यति।

नन्वात्मानं बहु विगणयन्नात्मवैवालम्बे तत्कल्याणि त्वमपि नितरां मा गमः कातरत्वम्।
कस्यात्यन्तं सुखमुपनतं दुःखमेकान्ततो वा नीचैर्गच्छत्युपरि च दशा चक्रनेमिक्रमेणा।

(उ०मे० 46)

दामपत्य जीवने पुत्रमहिमा महत्त्वस्य महाकवि भवभूतिप्रणीत उत्तरामचरिते कथयते–

प्रसवः खलु प्रकर्ष पर्यन्तः सेहस्य। परं चैतदन्योन्य संश्लेषणं पित्रोः।

अन्तःकरण तत्त्वस्य दम्पत्योः सेहसंश्रयात् आनन्दग्रंथिरेकोऽयम पत्यमिति पठ्यते।

उत्तररामचरित (3/7)

मानवजीवने स्तीश्च पुरुषः सम्पूरक रुपेण भवति। तेषाम् मध्ये कश्चिद् विभाजकरेखाः सम्भव न अस्ति। मालतीमाधव नाटके दामपत्यप्रेमस्य इति रुपेण परिभाषितंः अस्ति–

प्रेयो मित्रं बन्धुता वा समग्रा, सर्वे कामाः शेवधिर्जीवितं वा।
स्त्रीणां भर्ता धर्मदाराश्च पुंसमित्यन्योन्य वत्सयोज्ञतिमरन्तु।।

(मालती माधव, 6/18)

भवभूतिः उत्तरामचरिते दामपत्यजीवनस्य विशद वर्णनं अस्ति। येषां राम–सीतायोः आदर्श दाम्पत्यप्रेमस्य प्रतीक रुपेण प्रदर्शितम्–

व्यतिषजति पदार्थानान्तरः कोऽपि हेतुर्न खलु बहिरूपाधीन्प्रीतयः संश्रयन्ते।
विकसित हि पतङ्ग्स्योदये पूण्डरीकं, द्रवति च हिमरश्मावुद्गते चन्द्रकान्तः।

(उ०म० 6/12)

दामपत्य जीवने पत्नयाः महत्त्वं वर्तते कथयते–

इयं गेहे लक्ष्मीरियममृतवर्तिर्नयनयो। रसावस्याः स्पर्शो वपुषि बहुलश्चन्दनरसः।
अयं बाहु कष्ठो शिशिरमसृणो मोक्तिकसरः किमस्या न प्रेयो यदि परमसह्यस्तु विरहः।

(उत्तररामचरित 1/38)

राम च सीतायोः दाम्पत्य–भावः आदर्शरुपेण सम्पूर्ण नारके परिलक्ष्यति। यथा–

त्वं जीवितं त्वमाति मे ह्रदयं द्वितीयं त्वं कौमुदी नयनयोरमृंत त्वमङ्गे्। (3/31)

अत दम्पती परस्पर विरहितौ जीवनावलम्बनर हिताविव वर्तेते। उभयोः कृते परस्परं कुशलस्य अभिज्ञानावश्यकं वर्तते। दाम्पत्यस्य इयमेव साधना, प्रेम्णः अयमेव सर्वोत्कृषटः अभिलाषः यत प्रियः सकुशलः तिष्ठतु। एतदतिरिच्य मेघदूतकाव्य विश्लेषणाद् दाम्पत्यस्य स्वाभाविकं धर्मद्वयं प्रतीयते।

प्रकृतं दाम्पत्यं न कर्त्तव्यानन्तरं प्रणयिन औदासीन्यं स्यात्। गाढप्रणयेनापि जनेन स्वाधिकार प्रयन्तेन न भवितण्यम्। तेन खलु यक्षः कुबेरशापादस्तगमित महिमा सञ्जातः।

दाम्पत्यस्य स्वभावोऽयं यत् सम्भोगापेक्षतया विप्रलम्भेन एव प्रेम्णः परिपाकः। सम्भोग श्रृंगारः कालिदासेन नोपेक्षितः। अत एव यक्षस्य कामवास्यायाः वर्णनमपि तेन सविस्तारं विहितम्। परन्तु विप्रलम्भेवहारेण सम्भोगस्य प्रगाढतरे स्थायिनि प्रेम्णि उत्तरणमेव दाम्पत्यमहिम्नो लक्षणम्।

परिशीलित ग्रन्थ सूची

1. कालिदासः, मेघदूतम् सम्पादक– तरणीश झाः रामनारायण लाल विजय कुमार, इलाहाबाद।
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Procedure for Coordinates Conversion between NTM and UTM Systems in Minna Datum Using AllTrans and Columbus Software

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ABSTRACT

As the Edo State Branch of the Nigerian Institution of Surveyors (NIS) has decided to align with the agency (Edo Geographic Information Service) that is responsible for the processing of Certificate of Occupancy to be determining positions in the UTM system, the coordinates of the existing controls in the State have to be converted to UTM coordinates using conversion software. Consequently, this paper presents detailed procedures for the application of AllTrans and Columbus software for positions conversion between NTM and UTM systems in Minna datum. The Minna datum properties, as well as the NTM and UTM parameters, have been detailed for effective use. The step by step procedures to consider when applying the software have enumerated. It was recommended that the Edo State branch of the institution (NIS) should get the full and the latest version of the software. It was also recommended that there should be a lecture for the practical demonstration of the detailed procedures.

Keywords: Coordinates, Conversion, NTM, UTM, AllTrans, Columbus, Software, Minna Datum, Clarke 1880

I. INTRODUCTION

The Edo State Government of Nigeria has established an agency responsible for the processing of Certificate of Occupancy. The agency known as the Edo Geographic Information Service uses orthophotos for positions determination. The orthophotos were georeferenced with Universal Traverse Mercator (UTM) coordinates in Minna datum. Thus, the positions determined by the agency using the orthophotos are in UTM. The system does not have a frame to realize it in the State.

Over the years, positions of points have been determined in the State by Surveyors in the Nigeria Traverse Mercator, NTM (state plane) which is also known as the National Origin. These two systems (NTM and UTM) are rectangular coordinate systems measured in linear metres. But they are different in origin and scale. The processing of a Certificate of Occupancy requires the use of a survey plan produced by a Registered Surveyor. Presently, Surveyors in the State are producing survey plans with respect to the National Origin (NTM) while the agency is checking/charting the positions determined in NTM by the private practising Surveyors using their (the agency) system designed to determine positions in UTM. Checking/charting the NTM coordinates by the agency with its system requires the conversion of the NTM positions to UTM coordinates. Consequently, the Nigerian Institution of Surveyors, Edo State Branch has decided to be determining positions in the State in the UTM system to align the agency. To do this, the NTM positions of all the existing control stations in the State must be converted to UTM positions of the same controls. This is necessary as any

survey carried out must be connected to as well as oriented with not less than three control stations. The switching from NTM to UTM position determination by the Institution was discussed in its meeting held on 1st June 2019, but the final decision is yet to be conveyed to the respective state surveyors. The conversion of positions in a rectangular system (NTM or UTM) to another rectangular system (NTM or UTM), requires the coordinates to be first converted to geographic coordinates then from geographic coordinates to the positions of the points in any other rectangular coordinate system of interest. Also, from the geographic coordinates, the geocentric coordinates (XYZ) of the points can be determined. It is to be noted here that since the conversion is within Minna datum, transformation/datum shift parameters are not needed. Datum shift parameters are needed when transforming between two datums say WGS 84 and Minna datums.

To convert coordinates from one rectangular coordinate system to another, transformation /conversion software is used. Consequently, this paper presents detailed procedures for the conversion of positions from one rectangular coordinate system to another using AllTrans and Columbus software. These software have been compared with other transformation/conversion software and recommended for application in Nigeria. The comparison of the software is detailed in Eteje *et al*. (2018). For effective application of the two conversion software in Edo State as well as the entire country, the properties of the Minna datum, the NTM projection (the three belts parameters) and those of the UTM projection (the three zones parameters) must be known. Also, the extent/bound width of each belt and zone in each state must be known. This will enable the belt and the zone which the positions to convert be identified before conversion. Edo State is partly west and mid belts, and partly zones 31 and 32.

1.1 AllTrans Software

According to George (2012), use the AllTrans application to perform coordinate transformations between various coordinate systems. As mentioned above, one can perform conversions between coordinates using different mathematical representations and geodetic systems. One can perform transformations between Gauß-Krüger coordinates, UTM coordinates, geographic coordinates and 3D-Cartesian coordinates. Manually input the data or import it to perform the transformation. With AllTrans software, 7-Parameter Datum Transformation and calculation of datum transformation parameters using identical points can be carried out.

1.2 Columbus Software

Columbus is a one, two, and three dimensional network adjustment, network pre-analysis and coordinate transformation software package which allows one to create, edit, solve and analyse Vertical, Geodetic, State Plane, UTM, Custom Projection and Local NEE (North, East and Elevation) surveys anywhere in the world (Columbus, 2009). Columbus accepts terrestrial and/or GPS (satellite) observations to define networks. Columbus is not just a network adjustment package; it is a complete toolkit which can be used for on-the-fly COGO computations, coordinate transformations, geoid modelling and computation of areas of selected polygons in a project. According to Columbus (2009), to report coordinate results in a different form, Columbus provides a powerful set of coordinate transformation tools to generate Geodetic, State Plane, UTM, Custom Projection, Earth Centred Earth Fixed Cartesian, or Local North, East and Elevation (NEE or NEU) positions. To transform geodetic positions from one datum to another, Columbus provides rigorous three, four and seven parameter least squares datum transformation capability. Columbus also includes an assortment of Geodetic, State Plane, UTM, Local NEE

coordinate geometry (COGO) routines for ad-hoc computations, network loop closure and open-ended traverses.

1.3 The Nigeria Geodetic Datum

According to Eteje *et al.* (2018), the Nigeria Minna datum is a geodetic datum that is suitable for use in Nigeria-onshore and offshore. Minna datum references the Clarke 1880 (RGS) ellipsoid (Semi-major axis, a = 6378249.145m; Flattening, f = 1/293.465) and the Greenwich prime meridian. The datum origin is a fundamental point: Minna base station L40. Latitude: 9°38'08.87"N, longitude: 6°30'58.76"E (of Greenwich). It is a geodetic datum for topographic mapping. It was defined by information from NIMA (Eteje *et al.*, 2018). Uzodinma *et al.* (2013) gave the orthometric height, H of station L40 as 281.13m.

1.4 Conversion of NTM and UTM Northing and Easting Coordinates to Geodetic Coordinates (φ, λ, h)

The conversion of the two rectangular systems (NTM and UTM) coordinates to geographic positions, requires the application of the same models. The systems only differ in origin and scale factor. The models for the conversion of the NTM and UTM coordinates to geodetic or geographic coordinates as given by Kiliç, (2005) are:

$$\varphi = fp - Q_1(Q_2 - Q_3 + Q_4) \quad (1)$$

$$\lambda = \lambda_o + (Q_5 - Q_6 + Q_7)/\cos(fp) \quad (2)$$

Where,

$$Q_1 = N_1 \tan(fp)/R_1 \quad (3)$$

$$Q_2 = D^2/2 \quad (4)$$

$$Q_3 = (5 + 3T_1 + 10C_1 - 4C_1^2 - 9e'^2)D^4/24 \quad (5)$$

$$Q_4 = (61 + 90T_1 + 298C_1 + 45T_1^2 - 3C_1^2 - 252e'^2)D^6/720 \quad (6)$$

$$Q_5 = D \quad (7)$$

$$Q_6 = (1 + 2T_1 + C_1)D^3/6 \quad (8)$$

$$Q_7 = (5 - 2C_1 + 28T_1 - 3C_1^2 + 8e'^2 + 24T_1^2)D^5/120 \quad (9)$$

$N_1 = a/(1 - e^2 \sin^2(fp))^{1/2}$ (Radius of curvature in prime vertical) (10)

$$R_1 = a(1 - e^2)/(1 - e^2 \sin^2(fp))^{3/2}$$

(Radius of curvature in meridian section) (11)

$$D = x/(N_1 k_o) \quad (12)$$

$$C_1 = e'^2 \cos^2(fp) \quad (13)$$

$$T_1 = \tan^2(fp) \quad (14)$$

$e'^2 = (ea/b)^2 = e^2/(1 - e^2)$ = Second eccentricity squared (15)

$e^2 = (a^2 - b^2)/a^2$ = First eccentricity squared (16)

$$fp = \mu + J_1 \sin(2\mu) + J_2 \sin(4\mu) + J_3 \sin(6\mu) + J_4 \sin(8\mu)$$ = Footprint Latitude (17)

$$\mu = M \Big/ \left[a(1 - (e^2/4) - (3e^4/64) - (5e^6/256)...) \right] \quad (18)$$

$$M = y/k_o \quad (19)$$

$$e_/ = \left[1 - (1 - e^2)^{1/2}\right] \Big/ \left[1 + (1 - e^2)^{1/2}\right] \quad (20)$$

$$J_1 = \left[(3e_/2) - (27e_/^3/32)..\right] \quad (21)$$

$$J_2 = \left[(21e_/^2/16) - (55e_/^4/32)..\right] \quad (22)$$

$$J_3 = (151e_/^3/96..) \quad (23)$$

$$J_4 = (1097e_/^4/512..) \quad (24)$$

$a =$ Semimajor axis

$b =$ Semiminor axis

k_o = Scale Factor (0.9996 for UTM and 0.99975 for NTM)

x = Easting Coordinate (relative to the Central Meridian, CM: (subtract the CM from conventional UTM coordinate, *x;* 500,000mE for UTM while it varies for NTM, west belt = 230738.266mE, mid belt = 670553.984mE and east belt = 1110369.702mE).

y = Northing Coordinate.

1.5 Conversion of the Geodetic Coordinates (φ, λ, h) to Plane Rectangular Systems (NTM and UTM) Coordinates

The models for the conversion of geodetic coordinates to either of the two local plane rectangular (NTM or UTM) coordinates are the same. The differences in the two plane systems are in the properties to be used in the conversion. Thus, the origin, and scale factor. To convert the geographic coordinates (latitude and longitude) on the local ellipsoid to either NTM or UTM northing and easting, equations (25) to (34) given by Manchuk (2009) are used.

$$E = k_o N\left[\begin{array}{l} A+(1-T+C)A^3/6+(5-18T+ \\ T^2+72C-58e'^2)A^5/120 \end{array}\right] \quad (25)$$

$$N = k_o\left[\begin{array}{l} M-M_o+N\tan\varphi[A^2/2+(5-T+ \\ 9C+4C^2)A^4/24+(61-58T+T^2+ \\ 600C-330e'^2)A^6/720] \end{array}\right] \quad (26)$$

$$k = k_o\left[\begin{array}{l} 1+(1-C)A^2/2+ \\ (5-4T+42C+13C^2-28e'^2)A^4/24+ \\ (61-148T+16T^2)A^6/720 \end{array}\right] \quad (27)$$

Where,

$k_o = 0.99975$ for NTM and 0.9996 for UTM (28)

$e'^2 = e^2/(1-e^2)$ = Second eccentricity squared (29)

$e^2 = 2f - f^2$ eccentricity squared (30)

N = Radius of curvature as given in equation (2)

$T = \tan^2\varphi$ (31)

$C = e'^2\cos^2\varphi$ (32)

$A = (\lambda-\lambda_o)\cos\varphi$ (33)

N = Northing of point.

E = Easting of point.

φ = Latitude of point

λ = Longitude of point

λ_o = Longitude of point of center meridian of belt or zone.

$$M = a\left[\begin{array}{l} (1-e^2/4-3e^4/64-5e^6/256- \\ \cdots)\varphi-(3e^2/8+3e^4/32+ \\ 45e^6/1024+\cdots)\sin^2\varphi+ \\ (15e^4/256+45e^6/1024+\cdots)\sin^4\varphi- \\ (35e^6/3072+\cdots)\sin^6\varphi+\cdots \end{array}\right] \quad (34)$$

M = Distance on the meridian from parallel of false origin (4°N for NTM and 0° for UTM) to the parallel, φ_A of point.

φ_A = Latitude of the point

According to Manchuk (2009), M_o is computed using Equation (34) for φ_o, which is the latitude crossing the central meridian at the origin of the (*E, N*) coordinates. Equations (1) to (34) are used to develop programs which the transformation/conversion software normally apply during computation / conversion.

1.6 Properties/Characteristics of Nigeria (Modified) Transverse Mercator projection (NTM)

The NTM is a modified version of TM adopted for Nigeria. The modifications take care of the large expanse of the country which covers about l0° (i.e. 4°N - 14°N) latitude and 12° (i.e. 2° 30° - 14° 30°E) longitude. It is generally referred to as 3-belt system

(Omoigui, 1973 and Idowu, 2012). The characteristics of Nigeria (modified) Transverse Mercator Projection (NTM) as given by Uzodinma, *et al.* (2013) are:

1. NTM is a conformal projection
2. The country is divided into 3 belts each 4o wide (Figure 2).
3. The 3 belts are bounded in the north by the 14oNparallel and in the south by 4oN. Hence the false origin of northing is at latitude 4o N and False Northing, No = 0.000m (see Table 1).

Table 1: NTM Grid Parameters

Belt	Bounding Longitudes	Central Meridian (l_o)	False Easting of Central Meridian
West	2°30'E – 6°30'E	4°30' E	230738.266m E
Mid	6° 30' – 10°30'E	8° 30' E	670553.984m E
East	10°30' – 14°30'E	12° 30' E	1110369.702m E

Source: Uzodinma, et al (2013)

4. The scale factor at each central meridian is 0.99975.
5. A rectangular metric grid is superimposed on the three belts such that they intersect along the 9°N parallel.

According to Ufuah and Adesina (2005) and Eteje *et al.* (2018), the central meridians of the west and east belts are fixed respectively to be 439815.718 metres west and east of the central meridian of the mid belt along the 9°N parallel. The maximum angular distance of a point in a belt, from the central meridian of the belt, is 2°. In other words, each belt is 4° wide.

1.7 Properties/Characteristics of Universal Traverse Mercator (UTM) as Applied in Nigeria

Uzodinma *et al.* (2013) also gave the properties/characteristics of the UTM as applied in Nigeria as follow:

1. Nigeria is covered by zones 31, 32 and 33 of the UTM.
2. Each zone has its independent coordinate system with X-axis 500,000.0m west of the central meridian and Y-axis lying along the equator.

The UTM grid parameters are shown in table 2 as given by Uzodinma *et al.* (2013).

Table 2: UTM Grid Parameters

Zone	Bounding Longitudes	Central Meridian (l_o)	Grid Coord. of Central Meridian
31	0 °- 6°E	3°E	0.0m N, 500,000.0mE
32	6° – 12°E	9°E	0.0m N, 500,000.0mE
33	12° – 18°E	15°E	0.0m N, 500,000.0mE

Source: Uzodinma, et al (2013)

3. UTM in Nigeria is computed on the Clarke 1880 reference ellipsoid.

In the UTM, the maximum angular distance of a point in a belt, from the central meridian of the zone is 3º (Mugnier *et al.,* 2009). Thus, each zone is 6° wide. Its application is limited to between latitudes 84°N and 80°S as stated by Edan *et al.* (2014).

The properties/parameters of each of the plane rectangular systems, NTM and UTM and those of the datum in question (Minna datum) are applied during the conversion of the coordinates using the software. The parameters to apply in each plane rectangular

system depend on either the belt or the zone in which the positions are.

II. METHODOLOGY

The procedure for the application of the two software (AllTrans and Columbus software) for conversion between NTM and UTM in Minna datum requires the NTM coordinates be converted to geographic coordinates using equations (1) and (2), then the geographic coordinates are converted to UTM coordinates using equations (25) and (26). The same procedure is used when converting UTM coordinates to NTM positions (see figure 1).

2.1 Procedure for Application of AllTrans Software for Coordinates Conversion between NTM and UTM

The following steps are considered when converting positions from NTM to UTM:

1. Launch the software, displays as shown in Figure 2.
2. In Start Coordinate System, drop-down Area and select Nigeria. This will automatically display Minna (Clarke 1880 (RGS)) in the Geod Datum.

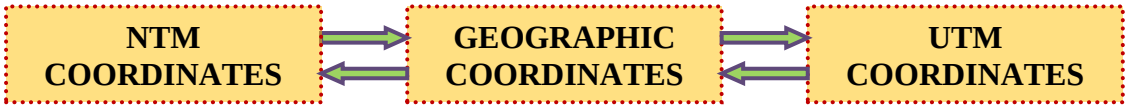

Fig. 1: Conversion between NTM and UTM Coordinates

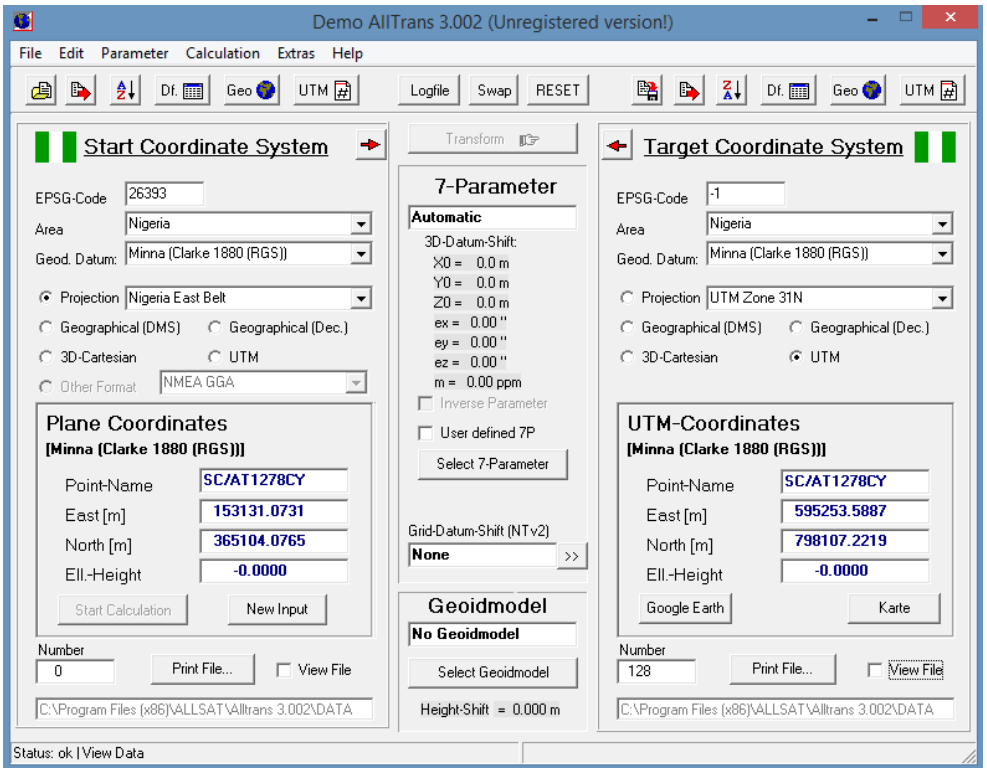

Fig. 2: Launched AllTrans Software

2.2 Procedure for Application of AllTrans Software for Coordinates Conversion between NTM and UTM

The following steps are considered when converting positions from NTM to UTM:

1. Launch the software, displays as shown in Figure 2.
2. In Start Coordinate System, drop-down Area and select Nigeria. This will automatically display Minna (Clarke 1880 (RGS)) in the Geod Datum.
3. Check Projection and select either west, mid or east belt, depending on the belt in which the positions to convert are.

4. In Target Coordinate System, drop-down Area and select Nigeria. This will also automatically display Minna (Clarke 1880 (RGS)) in the Geod Datum.

5. Check UTM and select either zone 31, 32 or 33, also depending on the zone in which the positions to convert are.

6. In Plane Coordinate, input the control ID and coordinates (northing and easting) accordingly one after the other.

7. Finally, click on Start Calculation at the bottom right-hand side of the software environment to convert and display the converted UTM coordinates. Note that at this step, the coordinates of a point are converted one after the other.

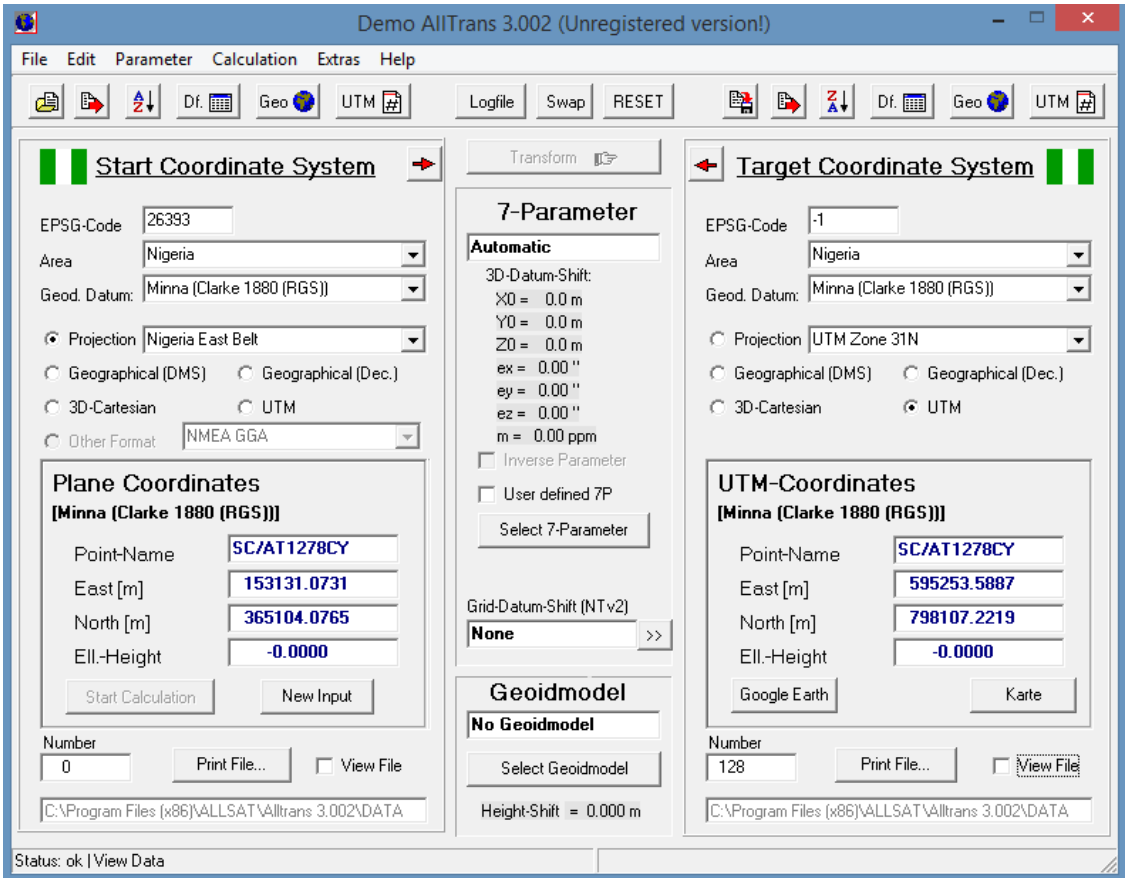

Fig. 2: Launched AllTrans Software

8. If the coordinates are many and they are to be converted at the same time, click the Parameter menu then, the Format of Data submenu to select State System. This will display the Start System Data Format dialog box. In the dialog box, click on Plan Coord tab and check/select data format of interest say Name, North, East and Height and click OK (see Figure 3).

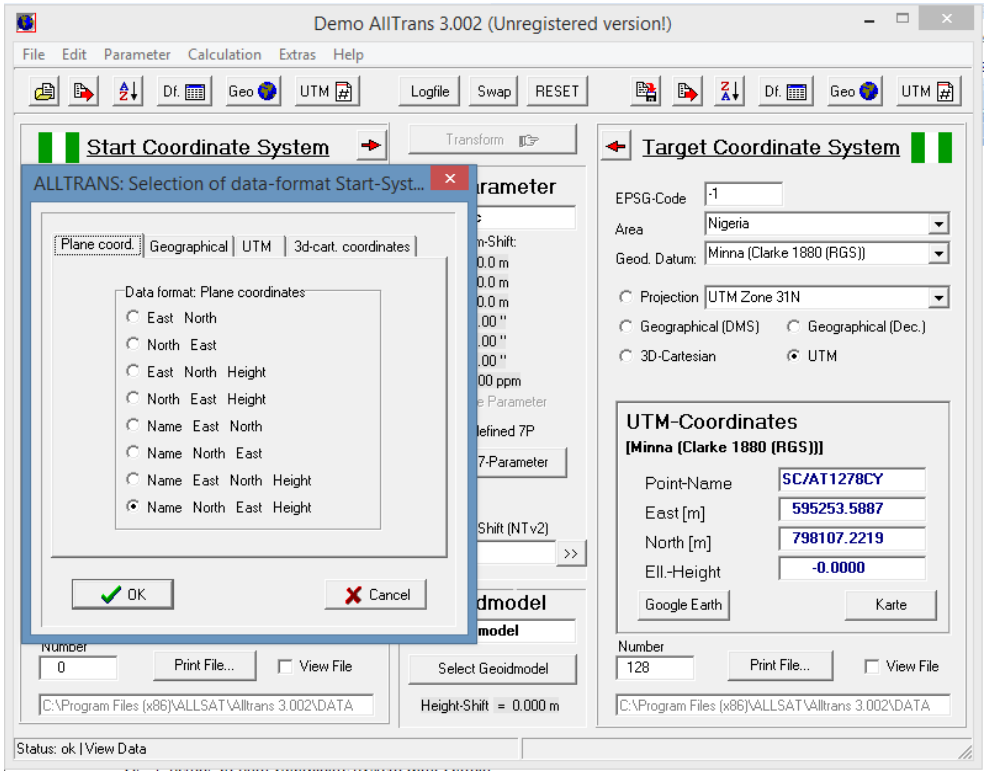

Fig. 3: Setting of Start Coordinate System Data Format

9. Also, set the Target Coordinate System Data Format. Click the Parameter menu then, the Format of Data submenu to select Target System. This will display the Target System Data Format dialog box. In the dialog box, click on UTM tab and check/select data format of interest say Name, North, East and Height and click OK (see Figure 4). Note that the Start and the Target Coordinate System data format must be the same.

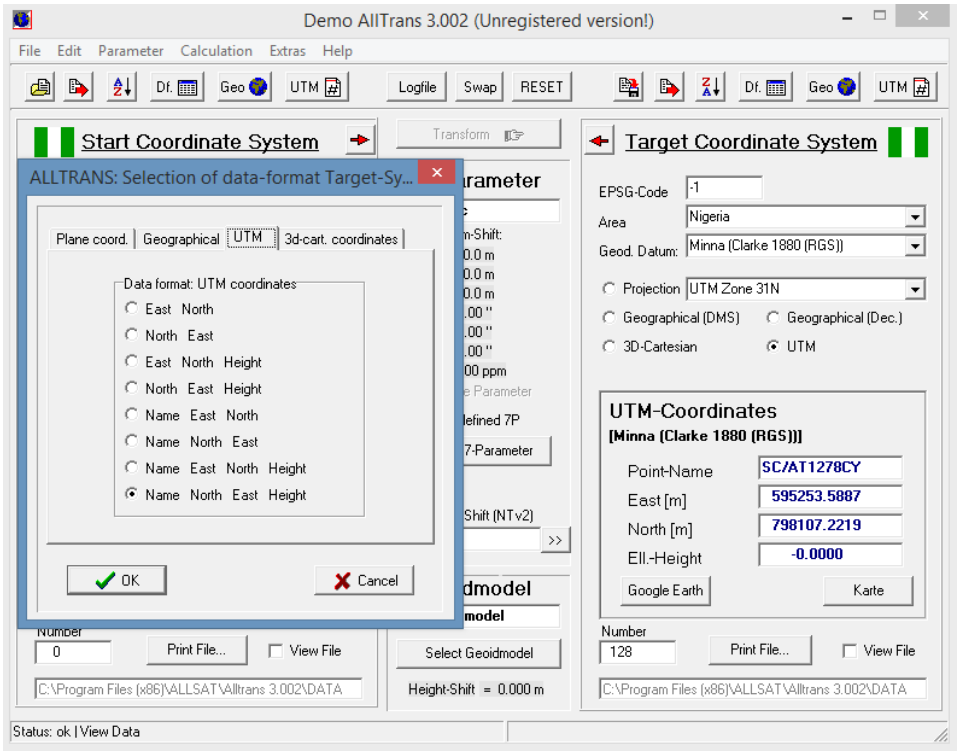

Fig. 4: Setting of Target Coordinate System Data Format

10. Type the input coordinates (NTM) in notepad in the order of the chosen data format and save the file on either Desktop or in Document.
11. Click on the File menu and select Open File (File Input) submenu. Navigate to where the saved input file is and import the NTM coordinates to the software environment.
12. Click on Start Calculation at the bottom left-hand side of the software to convert the NTM coordinates in the imported file.
13. Click on View File at the bottom right-hand side of the software to display the converted UTM coordinates.
14. Also, click on View File at the bottom left-hand side of the software to display the inputted NTM coordinates (See Figure 5).

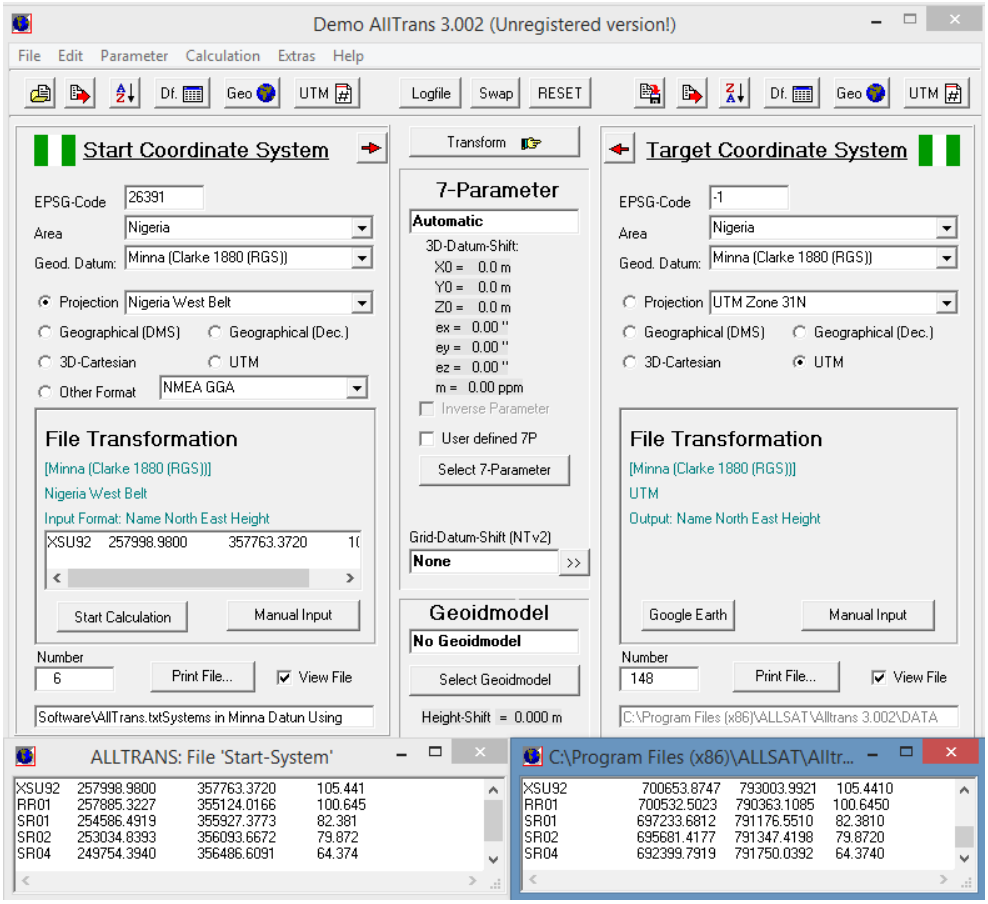

Fig. 5: Inputted NTM and Converted UTM Coordinates

To convert from UTM to MTN, the same procedure is used except for the following:

1. In step 3, the Start Coordinate System will be set to UTM and either zone 31, 32 or 33 will be selected, depending on the zone in which the UTM coordinates to convert are.
2. In step 5, check Projection and select either west, mid or east belt, depending on the belt in which the positions to convert are.
3. In step 6, in UTM Coordinate, input the control number and the UTM coordinates (northing and easting) accordingly one after the other.
4. In step 6, click on Start Calculation to convert and display the converted NTM coordinates at the bottom right-hand side of the software environment.
5. In steps 8 and 9, set the Start (input) and the Target (output) Coordinate Systems data formats to UTM and NTM respectively. And they must be the same.

6. In step 12, also click on Start Calculation at the bottom left-hand side of the software to convert the UTM coordinates in the imported file.
7. In steps 13 and 14, click on View at the bottom right and left-hand sides to respectively display the converted NTM and the inputted UTM coordinates.

2.3 Procedure for Application of Columbus Software for Coordinates Conversion between NTM and UTM

The conversion of coordinates between two rectangular systems using Columbus software, requires the rectangular coordinates be converted to geographic positions then, the geographic positions are re-entered into the software and converted to rectangular coordinates of interest. Columbus is not like AllTrans software that does the conversion directly. The following steps are considered when converting positions from NTM to UTM:

1. Launch the software.
2. Click on the File menu to select New as shown in Figure 6. This will display a new working environment.

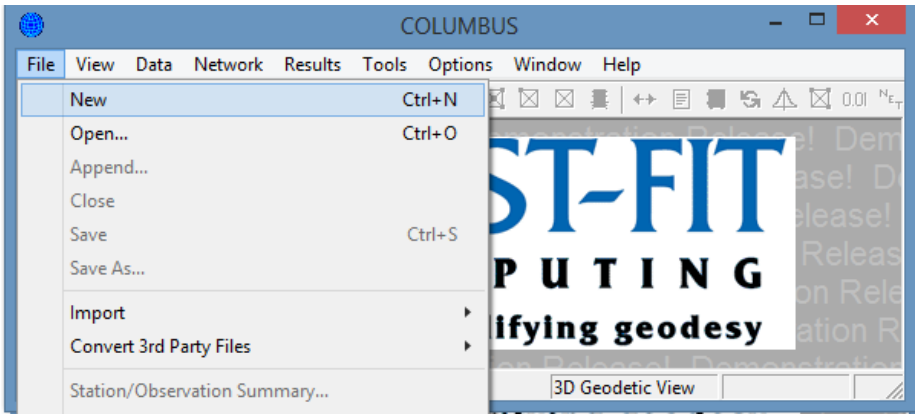

Fig. 6: Creating New Working Environment

3. Click on Options menu to select Datum submenu. This will display Select a Datum dialog box. In the dialog box, select Clarke 1880 and click OK (see Figure 7).

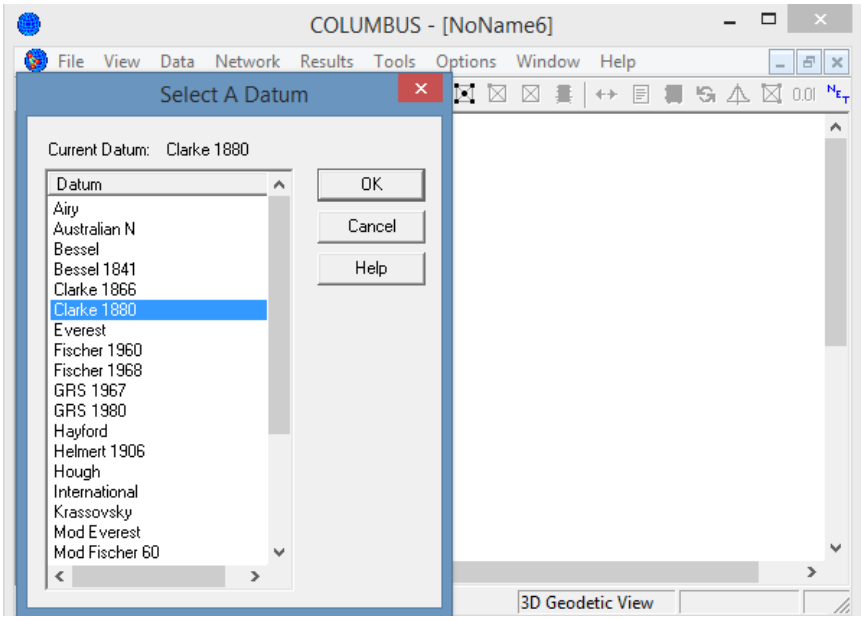

Fig. 7: Selection of Datum (Ellipsoid)

4. Also, click on the Options menu to select Unit submenu. This will display Linear and Angular Units dialog box. In the dialog box, check Metres in Linear Units, Degrees in Angular Units and DD.MMSSssss (Degree Minute and Second) in DMS or GMS Input and click OK (see Figure 8).

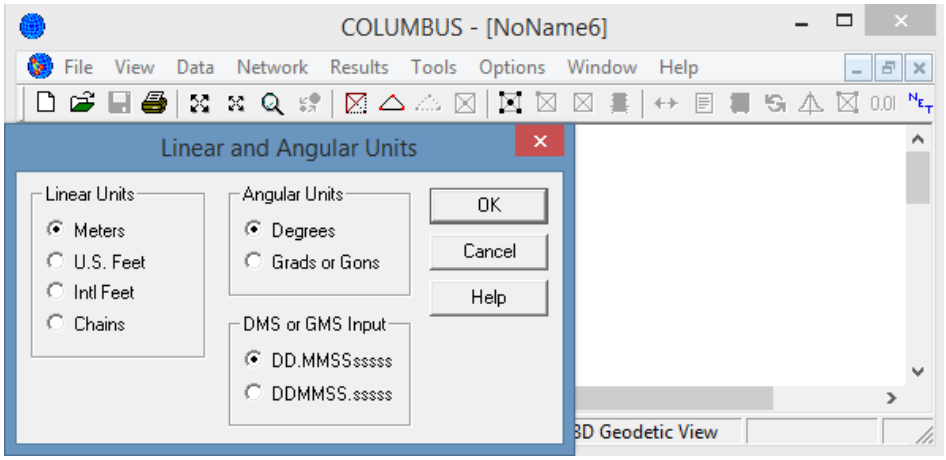

Fig. 8: Linear and Angular Units Settings

5. To set/enter the NTM belt parameters in which the positions to convert are, click on Options menu to select Projection submenu. In the Projection submenu, select State Plane Zones to display Select/Setup The Current Projection Zone dialog box. In the dialog box, select User Define (UD Traverse Mercator, TM) (see Figure 9) and click OK to display Setup Traverse Mercator Projection dialog box. In the dialog box, enter the belt parameters in which the coordinates to convert are. Enter the following parameters for the Nigeria West belt given in the first row of Table 1 as shown in Figure 10.

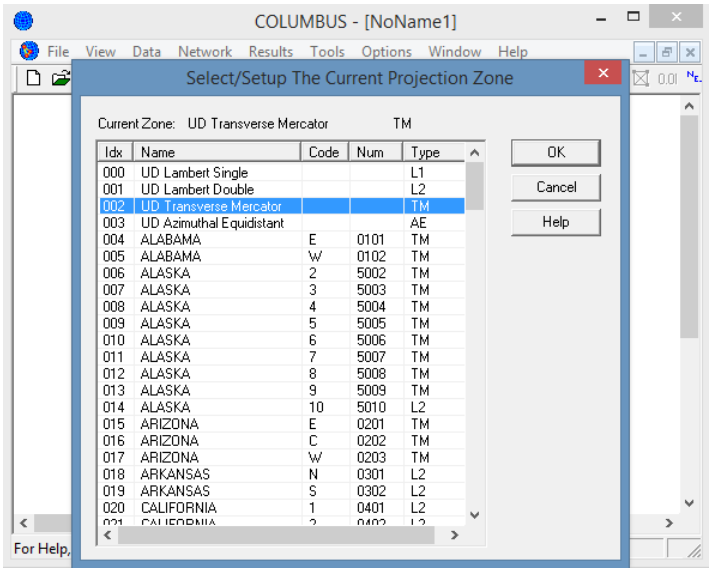

Fig. 9: Selection of Current Traverse Mercator Belt

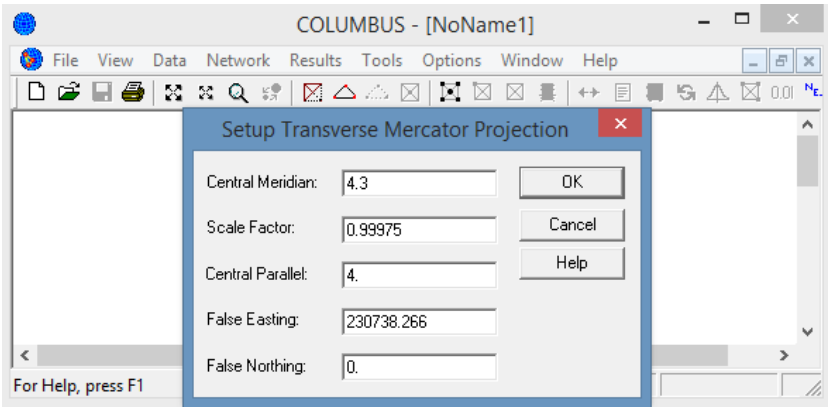

Fig. 10: Entering of the Positions Belt Parameters (Nigeria West Belt Parameters)

6. To set/enter the UTM zone parameters in which the positions to convert are, click on Options menu to select Projection submenu. In the Projection submenu, select UTM Zone Setup to display UTM or TM Zone Setup dialog box. In the dialog box, select the zone in which the coordinates to convert are and click OK. Here, zone 31 is selected as shown in Figure 11. Note that the selection of a zone will automatically update the other fields of the dialog box.

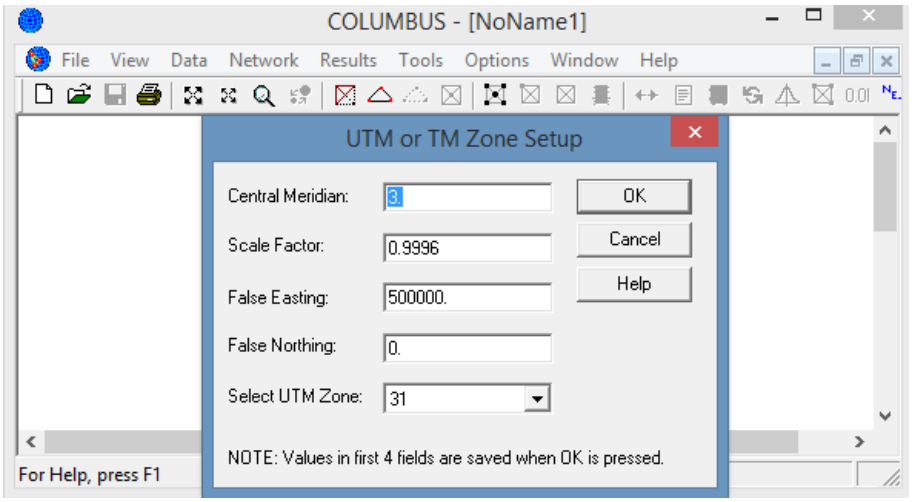

Fig. 11: Entering of the Positions Zone Parameters (Zone 31 Parameters)

7. Having done with the necessary settings, click on the Data menu and select Stations submenu to display Add or Modify Station Data dialog box. In the dialog box, click on State Plane to enter the NTM coordinates. Also, click on Add 25 Rows at the top right-hand side of the dialog box to display the spreadsheet in which the positions information will be entered. Enter the stations' IDs/Numbers, Northing and Easting coordinates of the points and click Keep and Exit tab at the bottom left-hand side of the dialog box (see Figure 12). This will exit the dialog box and plot the points/stations in the software environment (see Figure 13).

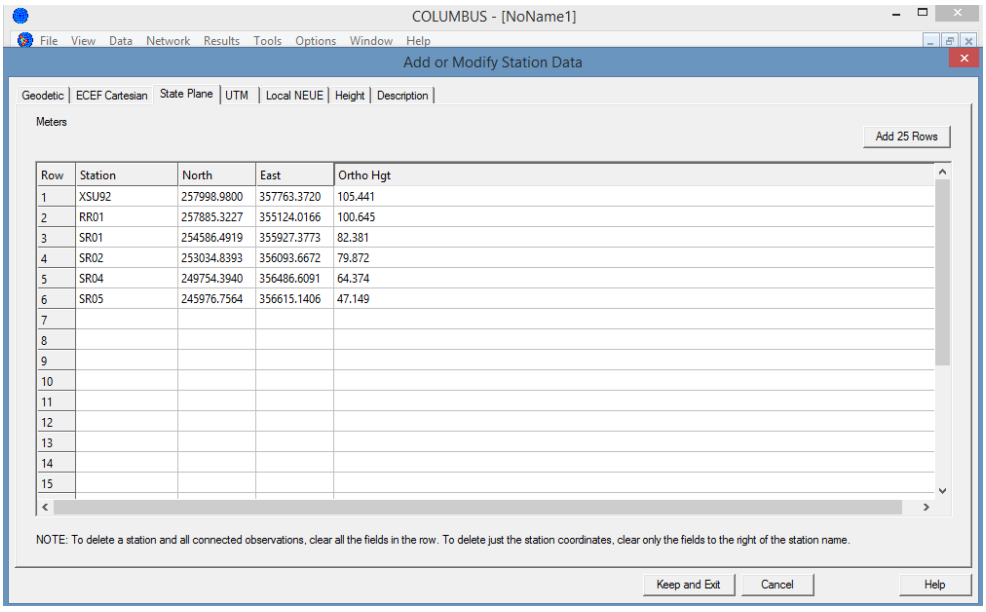

Fig. 12: Entering of the NTM Coordinates

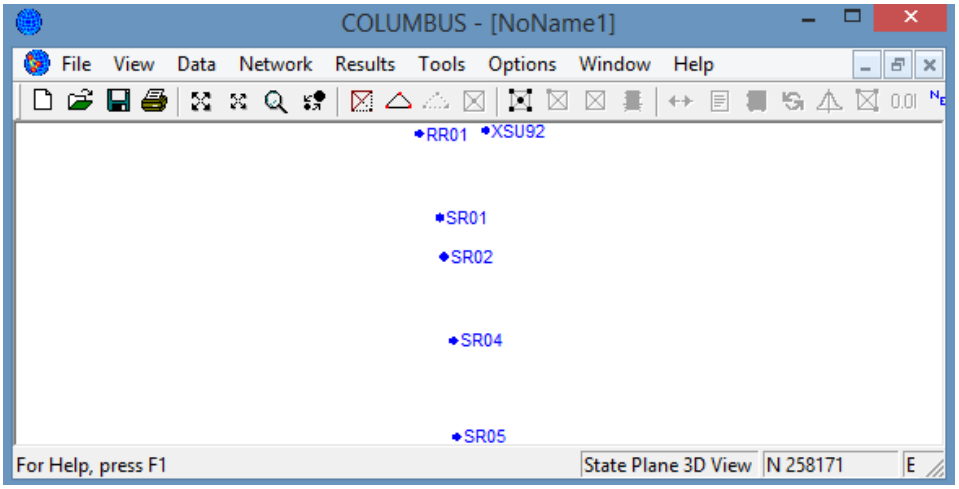

Fig. 13: Plotted UTM Points in the Software Environment

8. To convert the NTM coordinates to geodetic positions, click on the Tools menu to select Transformation submenu. In the Transformation submenu, select State Plane to Geodetic to display State Plane to Geodetic Zone UD Traverse Mercator dialog box. In the dialog box, click on Compute at the bottom left hand side to display Select Station to Transform dialog box. In the displayed dialog box, click Select All at the middle right-hand side and click OK at the top right-hand side (see Figure 14). The converted geodetic coordinates are displayed in the State Plane to Geodetic Zone: UD Traverse Mercator dialog box. Also, see Figure 15.

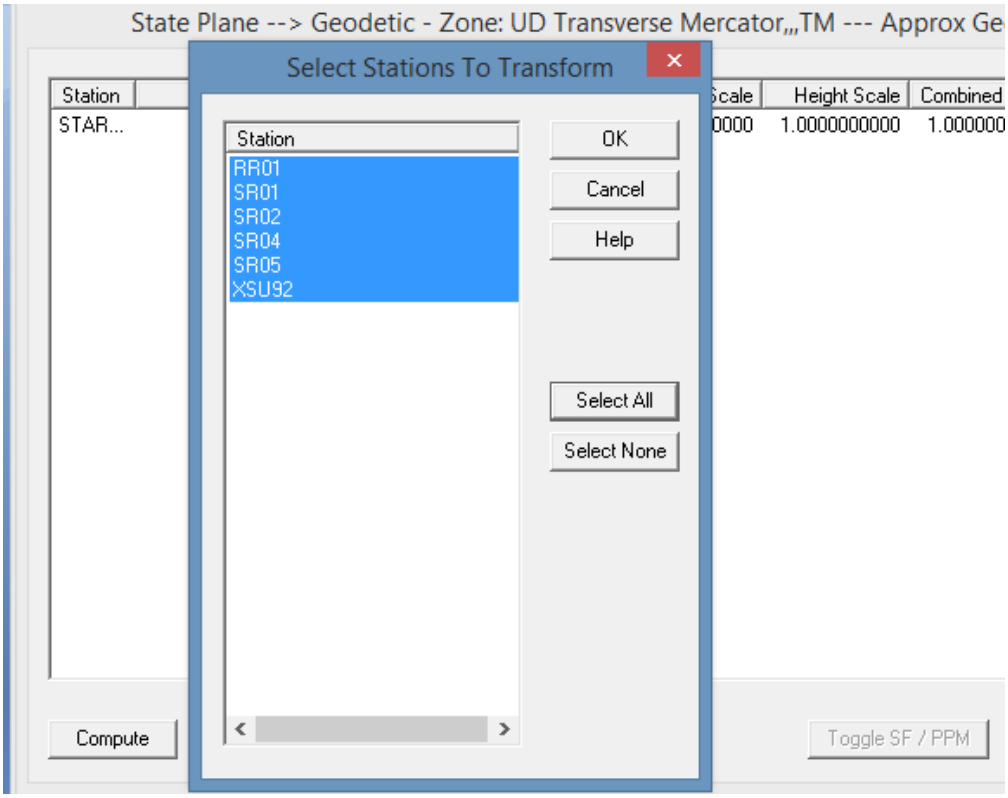

Fig. 14: Selected Points/Stations

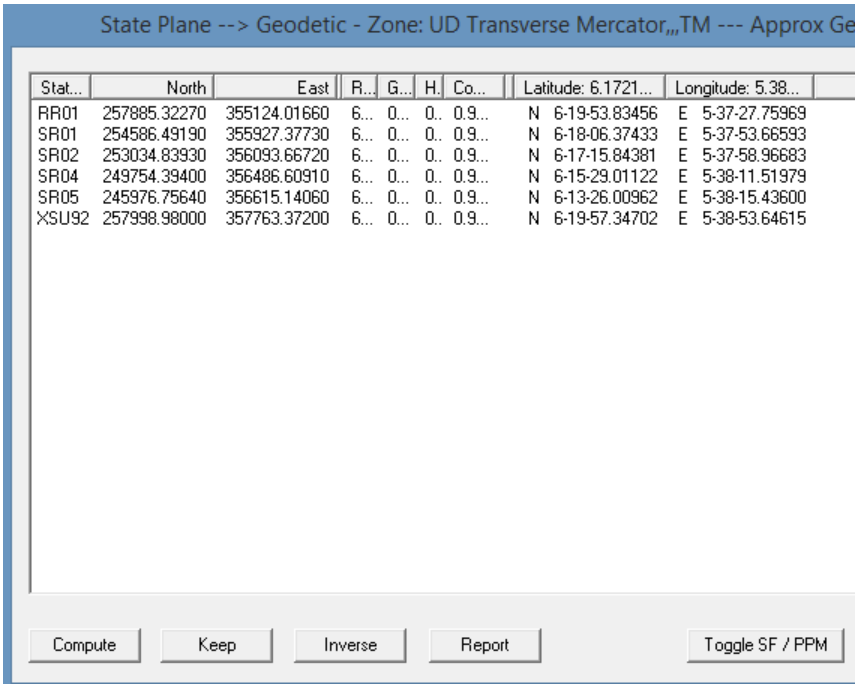

Fig. 15: Converted Geodetic Coordinates

9. To report the converted geographic coordinates, click on Report at the bottom left-hand side of the State Plane to Geodetic Zone: UD Traverse Mercator dialog box to save the converted coordinates/processing report on either Desktop or in the Documents folder. The processing report is given in both Excel and Notepad. Figure 16 shows the Notepad processing report.

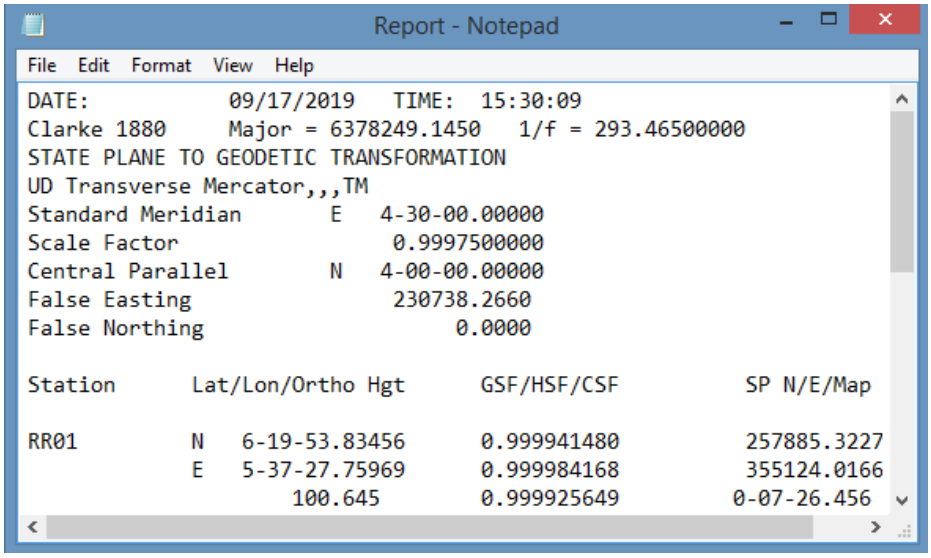

Fig. 16: Processing Report for Converted Geodetic Coordinates in Notepad

10. Having converted the NTM coordinates to geographic positions then, repeat step 7 to enter the converted geodetic coordinates in the Geodetic tab of the Add or Modify Station Data dialog box.

11. Repeat step 8 to convert the geodetic coordinates to UTM positions. In the Transformation submenu, select Geodetic to UTM.

12. Also, repeat step 9 to report the converted UTM coordinates (see Figure 17).

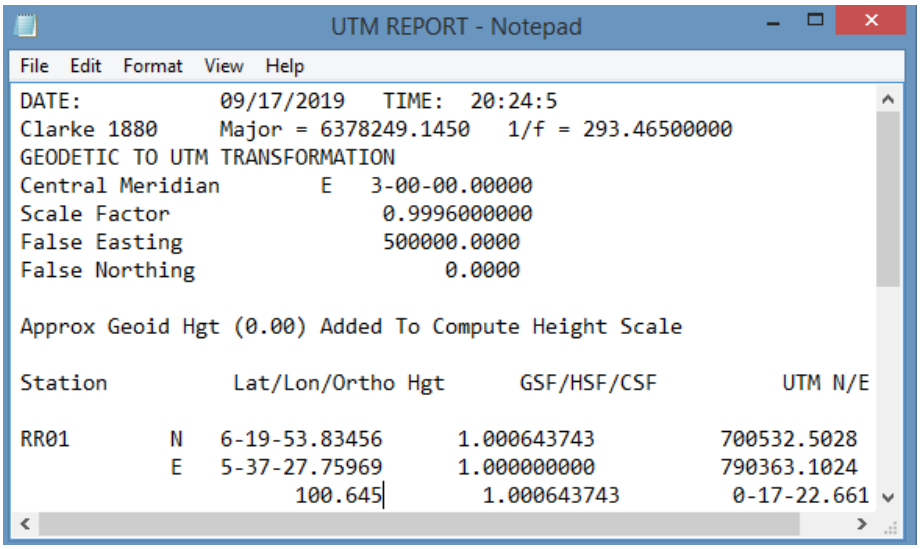

Fig. 17: Processing Report for Converted UTM Coordinates in Notepad

To convert from UTM to NTM with Columbus software, the same procedure is used except for the following:

1. In step 7, enter the UTM coordinates in the Add or Modify Station Data dialog box.
2. In step 8, select UTM to Geodetic in the Transformation submenu.
3. Having converted the UTM coordinates to geodetic positions, repeat step 7 to enter the converted geodetic coordinates in the Geodetic tab of the Add or Modify Station Data dialog box.
4. Repeat step 8 to convert the geographic coordinates to NTM positions.
5. Also, repeat step 9 to report the converted NTM coordinates.

III. CONCLUSIONS AND RECOMMENDATIONS

Having given detailed procedures for the use of AllTrans and Columbus software for the conversion of coordinates between NTM and UTM systems, the following conclusions and recommendations were made:

1. For effective application of the two software, considering the enumerated steps to be considered, the belt, as well as the zone in which the positions to convert are must be identified before the conversion process. This will enable the right, as well as the correct belt and zone parameters, be entered in the software.
2. The Minna datum, as well as Clarke 1880 ellipsoid parameters, should be correctly inputted into the software as the conversion is within Minna datum only. Thus, the Clarke 1880 ellipsoid is common to both coordinate systems in this regard.
3. The Edo State branch of the institution (NIS) should get the full and the latest version of the software.
4. There should also be a lecture for the practical demonstration of the detailed procedures.

IV. REFERENCES

[1] Columbus (2009): *Columbus 3.8 User Manual.* Best Fit Computing Inc. 17490 NW Woodmere Court Beaverton, Oregon 97006 USA.

[2] Edan, J. D., Amadi, J. W., Bem, A. A. and Amadi, C. A. (2014): On the Conversion of Coordinates from Nigeria Transverse Mercator to Universal Transverse Mercator Using a Simple Mathematical Model. *International Journal of Applied Science and Technology,* Vol. 4, No. 4, pp 292-299.

[3] Eteje, S. O., Oduyebo, O. F. and Olulade, S. A. (2018). On the Determination of NTM and UTM Positions from Post Processing of Static DGPS Observations on the Nigeria Minna Datum. *International Journal of Engineering Research and Advanced Technology (IJERAT)*, Vol. 4, No. 10, pp 10-24. DOI: 10.31695/IJERAT.2018.3332.

[4] Eteje, S. O., Oduyebo, O. F. and Olulade, S. A. (2018). Comparative Analysis of Three Geodetic Datum Transformation Software for Application between WGS84 and Minna Datums. *International Journal of Engineering Science and Computing*, Vol. 8, No. 12, pp 19410- 19417.

[5] Eteje, S. O., Oduyebo, O. F. and Olulade, S. A. (2018): Comparison of the Positions Computed from DGPS/GNSS Observations Using the New/Unified and Various Old Transformation Parameters in Nigeria. *International Journal of Engineering Science and Computing (IJESC),* Vol. 8, No. 12, pp 19378-19385.

[6] George, N. (2012). AllTrans - Geodetic 3D Transformations. http://alltrans.findmysoft.com. Accessed 1st December, 2018.

[7] Idowu, T. O. (2012). Comparison of Numerical Techniques for Coordinate Transformation: The Case Study of Nigeria Transverse Mercator and Universal Transverse Mercator. *International Journal of Applied Science and Technology,* Vol. 2, No. 4.

[8] Kiliç, A. (2005). Coordinate Systems for a Naval Virtual Environment. Published M.Sc. Thesis of the Department of Computer Engineering, Middle East Technical University. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.633.1828&rep=rep1&type=pdf. Accessed 14th September, 2019.

[9] Manchuk, J. G. (2009). Conversion of Latitude and Longitude to UTM Coordinates. *Paper 410, CCG Annual Report 11.*

[10] Mugnier, C. J., C. P. and C. M. S. (2009). Grids and Datums: Federal Republic of Nigeria. *Photogrammetric Engineering and Remote Sensing*.

[11] Omoigui, D. A. (1973). The Nigerian Triangulation and the Scale Check Programme. Proceedings of the International Seminar on EDM Measurement. University of Lagos - Nigeria. In Idowu, T. O. (2012). Comparison of Numerical Techniques for Coordinate Transformation: The Case Study of Nigeria Transverse Mercator and Universal Transverse Mercator. *International Journal of Applied Science and Technology*, Vol. 2 No. 4.

[12] Ufuah M. E. and Adesina J. G.(2005). Conformal Transformation of Co-Ordinates in Nigeria. https://icaci.org/files/documents/ICC_proceedings/ICC2005/htm/pdf/oral/TEMA2/Session%201/DR.%20M.E.%20UFUAH%202.pdf. In Eteje, S. O., Oduyebo, O. F. and Olulade, S. A. (2018). On the Determination of NTM and UTM Positions from Post Processing of Static DGPS Observations on the Nigeria Minna Datum. *International Journal of Engineering Research and Advanced Technology (IJERAT)*, Vol. 4, No. 10, pp 10-24. DOI: 10.31695/IJERAT.2018.3332.

[13] Uzodinma, V. N., Oguntuase, J. O., Alohan, and Dimgba, C. N. (2013): *Practical GNSS Surveying*. Professor's Press Ltd, Enugu.

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Modelling Local Gravity Anomalies from Processed Observed Gravity Measurements for Geodetic Applications

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ABSTRACT

As the application of gravity data in applied sciences such as geodesy, geodynamics, astronomy, physics and geophysics for earth shape determination, geoid model determination, computation of terrestrial mass displacement, orbit computation of natural and artificial celestial bodies, realization of force standards and derived quantities and density distribution in the different layers in the upper crust and having considered the cost of direct gravity survey, the study presents modelling local gravity anomalies from processed observed gravity measurements for geodetic application in Benin City. A total of 22 points were used. The points were respectively observed with CHC900 dual frequency GNSS receivers and SCINTREX CG-5 Autograv to obtain their coordinates and absolute gravity values. The theoretical gravity values of the points were computed on the Clarke 1880 ellipsoid to obtain their local gravity anomalies. The free air and the Bouguer corrections were applied to the computed gravity anomalies to obtain the free air and the Bouguer gravity anomalies of the points. Least squares adjustment technique was applied to obtain the model variables coefficient/parameters, as well as to fit the fifth-degree polynomial interpolation surface to the computed free air and the Bouguer gravity anomalies. Kriging method was applied using Surfer 12 software to plot the computed and the models' free air and Bouguer gravity anomalies. Microsoft Excel programs were developed for the application of the models in the study area. The Root Mean Square Errors (RMSEs) and the standard errors of the two models were computed to obtain the dependability, as well as reliability of the models. It is recommended that whenever either free air or Bouguer gravity anomalies of points within Benin City are to be obtained for application in applied sciences, the determined models should be applied.

Keywords: Modelling, Free Air, Bouguer, Gravity, Anomalies, Geodetic Application, Benin City

I. INTRODUCTION

The application of local gravity data set in geodesy, geology, geophysics among others has led to different ways of sourcing the data. Locally, the data are obtained by carrying out gravity measurement with a gravity meter usually known as gravimeter. Globally, these data are obtained from satellite observation. To obtain these data locally using the gravimeter requires points of interest to be selected, selected points are monumented, carrying out DGPS/GNSS observation, carrying out gravity observation, processing the GNSS and the gravity observations. The GNSS observations are processed in the local datum, as well as the local ellipsoid adopted for geodetic computation in the area of study. Therefore, the coordinates of the selected points are obtained in the local datum. The local geodetic coordinates of the points are used for the computation of the theoretical, as well as the latitude gravity of the points. For the standard gravity to be

local, the computation has to be carried out on the local datum, as well as the local ellipsoid. The processing of gravimeter reading requires drift correction, atmospheric correction, free air correction, Bouguer correction and terrain correction. The drift is obtained either by reoccupying previously observed points or by closing the loop observations at the reference station. The computation of the gravity anomalies of the selected points which is the difference between the absolute gravity values reduced to the geoid and the latitude gravity computed on the local ellipsoid requires two basic corrections such as free air and Bouguer corrections. Gravity survey is very expensive. It requires the cost of instruments (GNSS receivers and gravimeter) hiring, cost of observation (GNSS and gravity observations), cost of labour and cost of data processing. According to Mariita (2009), gravity surveying is a labour-intensive procedure requiring significant care by the instrument observer. Gravity instruments require careful levelling before a reading is taken. In most cases, gravity observation exercise is normally carried out either by the State or Federal Government agencies. Usually, if the local gravity data acquisition exercise is to be undertaken by individuals, the number of observation points/stations is very small because of the cost of the survey. With the few points whose gravity anomalies have been determined, the gravity anomalies of new points can be modelled by fitting an interpolation surface to the points of known gravity anomalies.

The modelling of gravity anomalies from a set of processed gravity measurements requires the application of Geostatistical interpolation method. It involves the use of Kriging method. The method represents a true Geostatistical approach to interpolating a trend surface of an area. The method involves a two-stage process where the surface representing the drift of the data is built in the first stage and the residuals for this surface are calculated in the second stage. Applying the Kriging method, the user can set the polynomial expression used to represent the drift surface.

Gravity surveys have been carried by different researchers in various parts of the world at different accuracy, as well as reliability. Dawod (1998) established a national gravity standardization network for Egypt and respectively got RMSEs of 28.55mGal and 28.38mGal for free air and Bouguer anomalies. Cattin *et al.* (2015) carried out a gravity survey for the development of MATLAB software and got uncertainties of 2.6mGal and 2.8mGal. Also, Yilmaz and Kozlu (2018) compared three Global gravity models anomalies with observed values in western Anatolian parts of Turkey and got RMSEs of 15.42mGal to 16.02mGal for free air anomalies and 8.12mGal to 110.17mGal for Bouguer anomalies and standard deviation of 13.45mGal to 13.88mGal for free anomalies and 8.05mGal to 9.75mGal for Bouguer anomalies.

Gravity data set is required for application in geodesy, geodynamics, astronomy, physics and geophysics. Mickus (2004) also gave the application of gravity data set in environmental and engineering as follow: (1) detection of subsurface voids including caves, adits, mine shafts, (2) determining the amount of subsidence in surface collapse features over time (3) determination of soil and glacier sediment thickness (bedrock topography), (4) location of buried sediment valleys, (5) determination of groundwater volume and changes in water table levels over time in alluvial basins, (6) mapping the volume, lateral and vertical extent of landfills, (7) mapping steeply dipping contacts including faults and (8) determining the location of unexploded ordinances. According to Oluyori and Eteje (2019), since not all points can be observed or visited physically on the ground, the need for prediction/interpolation to obtain acceptable data/information is very important for decision making and analysis. In order for scientists and engineers in the above mentioned fields to carry out

their studies and solve problems relating to the environment and the earth itself which require the application of gravity data in Benin City, this study has determined the absolute gravity values of some selected points, computed their local gravity anomalies and fitted an interpolation surface to enable the gravity anomaly of any point of known coordinates to be determined by interpolation/prediction within Benin City. Consequently, the study presents modelling local gravity anomalies from processed observed gravity measurements for geodetic applications.

1.1 The Study Area

The study area is Benin City. It is the capital of Edo State in southern Nigeria. It is located in the southern part of the state. It consists of three Local Government Areas, Oredo LGA, Ikpoba Okha LGA and Egor LGA. Benin City is bounded at the north by Ovia North and Uhunmwode Local Government Areas, the west by Orhionmwon LGA, the east by Ovia South West LGA and the south by Delta State. It lies between latitudes 06^0 01' 54"N and 06^0 25' 35"N and longitudes 05^0 26' 23"E and 05^0 50' 05"E. It occupies an area of about 1,204 square kilometres with a population of about 1,749,316 according to 2019 projection. Figures 1a and 1b show the map of the study area. The study area topography is relatively flat.

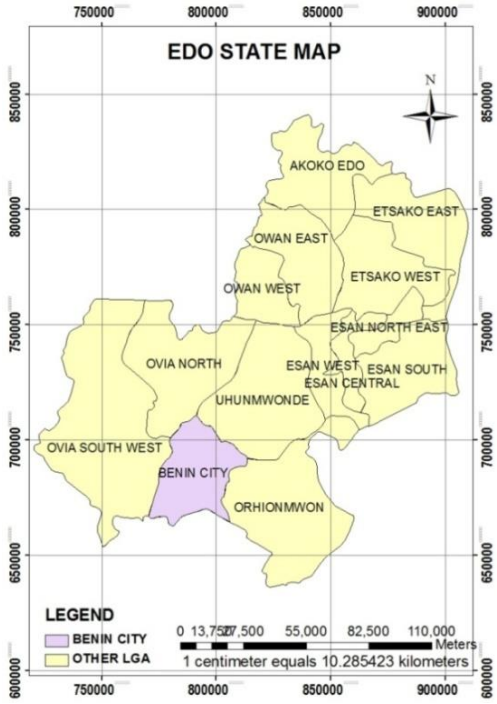


Figure 1a: Map of Edo State Showing Benin City
Source: Edo State Ministry of Lands and Surveys, Benin City

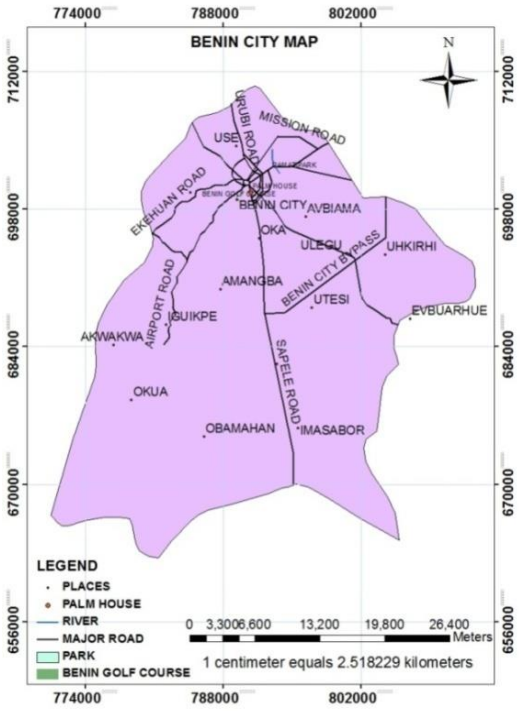


Figure 1b : Map of Benin City
Source: Edo State Ministry of Lands and Surveys, Benin City.

1.2 Application of Gravimetric Data in Geosciences

The applications of gravity data set in applied sciences such as geodesy, geodynamics, astronomy, physics and geophysics as given by Dawod (1998) are in Table 1:

Table 1: Gravimetric Application in Applied Sciences

Field	Application of Gravimetry
Geodesy	The gravity field modelling is crucial for deriving geometrically-defined quantities from the geodetic observation. If the distribution of the gravity values on the surface of the Earth is known, the shape of this surface may be determined. The most important reference surface for height measurements, the geoid, is a level surface of the gravity field.
Geodynamics	Temporal gravity changes discovered by repeated gravity observations represent important information of the computation of terrestrial mass displacement.
Astronomy	The terrestrial gravity field is required for the orbit computation of natural and artificial celestial bodies.
Physics	Gravity is needed in physical laboratories for the realization of force standards and derived quantities.
Geophysics	Gravimetric data has essential information about the density distribution in the different layers in the upper crust.

1.3 Cost of Gravity Observation and Processing

As mentioned earlier, the cost of a gravimetric survey is divided into the cost of instruments hiring, cost of observation, cost of labour and cost of data processing. The breakdown of international cost of gravity data acquisition and processing as given by Mariita (2009) consists of two components (Gravity meter rental and consulting services). The cost of instrument hire depends on the type of instrument (gravimeter). The consulting component consists of a gravity survey (data collection only), station surveying, data processing (Bouguer gravity anomalies) and data processing and interpretation (see Table 2).

Table 2: Typical International Costs for Gravity Surveys

Service	Costs
Gravity Meter Rental	
Lacoste and Romberg model G	\$50-60/day plus \$240-270 mobilization
Lacoste and Romberg model D	\$70-100/day plus \$240-270 mobilization
Scintrex CG3-M Autograv	\$100-130/day plus \$240-270 mobilization
Portable GPS Receivers	\$45-55/day plus \$90-110 mobilization
Consulting Services	
Gravity survey (data collection only)	\$900-1100/day
Station surveying	\$300-350/day
Data processing (Bouguer gravity anomalies)	\$200-300/day
Data processing and interpretation	\$300-400/day

Source: Mariita (2009)

1.4 Basics of Gravity

According to SpongIer and Libby (1968), the theory of gravity surveying is directly dependent on Newton's law of gravity. Newton's Law of Gravitation states that between two bodies of known mass the force of attraction (F) is directly proportional to the product of the two masses (m_1 and m_2) and inversely proportional to the square of the distance between their centres of mass (r^2) (Ismail, 2015). This implies that the smaller the distance (separation) (r) between the two masses (m_1 and m_2), the greater the force of attraction between them (m_1 and m_2) (Equation (1)).

$$F = G\frac{m_1 m_2}{r^2} \quad (1)$$

Where,

F = Force of attraction, expressed in Newton (N)

$m_1 m_2$ = Masses of the body, expressed in kg

r = Distance between the two masses in metres

$G = 6.673 \times 10^{-11} \mathrm{m^3 kg^{-1} s^{-2}}$ Gravitational constant

From Newton's second law of motion,

$$F = ma \quad (2)$$

$$a = \frac{F}{m} = \frac{F}{m_1} = G\frac{m_1}{r^2} \quad (3)$$

But $$a = g = G\frac{m}{r^2} \quad (4)$$

Also, density is mass per unit volume,

$$d = \frac{m}{v} \Rightarrow m = dv \quad (5)$$

Substituting equation (5) into (4), gives

$$g = G\frac{dv}{r^2} \quad (6)$$

Where,

a = Acceleration ($\mathrm{ms^{-2}}$)

d = Density ($\mathrm{kgm^{-3}}$)

v = Volume ($\mathrm{m^3}$)

g = Acceleration due to gravity

According to Saibi (2018), the c.g.s unit commonly used in gravity measurement is the milliGal: 1 mGal = 10^{-3} Gal = 10^{-3} cm s^{-2} = $10^{-5}\mathrm{ms^{-2}} = 10\,\mu\mathrm{ms^{-2}}$. In gravity surveys, commonly, mGal is used.

Equation (6) implies according to SpongIer and Libby (1968) that the value of gravity is directly proportional to the product of density and volume of a mass (earth materials beneath the gravimeter) and inversely proportional to the square of the distance from the attractive body. As the earth is not perfectly homogeneous, spatial variations of gravity are also a function of latitude and the adjacent terrain. At the equator, the value of gravitational acceleration on Earth's surface varies from 9.78 m/s² to about 9.83 m/s² at the poles (Figure 2) (Ismail, 2015).

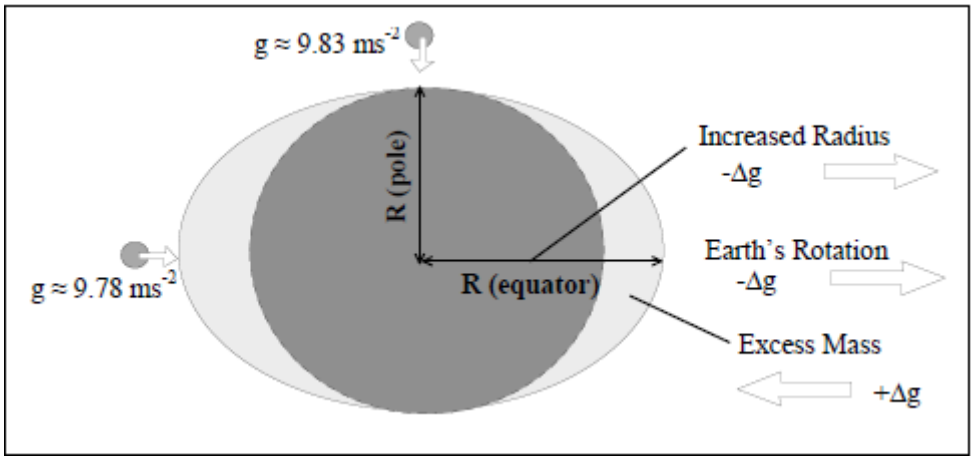


Figure 2: Gravity at the Equator and the Pole Source: Ismail (2015)

1.5 Corrections to Gravity Observations

1.5.1 Tide Correction

According to Valenta (2015), the tidal correction accounts for the gravity effect of Sun, Moon and large planets. Modern gravity meters compute the tide effects automatically. These background variations can be corrected for using a predictive formula (Equation (7)) which utilises the gravity observation position and time of observation (Mathews and McLean, 2015).

$$r_t = r_c + g_{tide} \quad (7)$$

Where,

r_t = Tide correction reading in $\mu\mathrm{ms^{-2}}$

r_c = Scale factor correction reading in $\mu\mathrm{ms^{-2}}$

g_{tide} = Earth Tide Correction (ETC) in μms^{-2}

1.5.2 Drift Correction

Gravimeters are very sensitive instruments. Temperature changes and elastic creep in springs cause meter readings to change gradually with time even if the meter is never moved (Saibi, 2018). Mathews and McLean (2015) also explained that the most common cause of instrument drift is due to the extension of the sensor spring with changes in temperature (obeying Hooke's law). To calculate and correct for daily instrument drift, the difference between the gravity control station readings (closure error) is used to assume the drift and a linear correction is applied as given in equation (8) (Mathews and McLean, 2015).

$$ID = r_{cs2} - r_{cs1} / t_{cs2} - t_{cs1} \quad (8)$$

Where,

ID = Instrument drift in μms^2 / hour

r_{cs2} = Control station second reading in μms^{-2}

r_{cs1} = Control station first reading in μms^{-2}

t_{cs2} = Control station second time

t_{cs1} = Control station first time

1.5.3 Atmospheric Correction

As stated by Mathews and McLean (2015), the gravity effect of the atmosphere above the reference datum can be calculated with an atmospheric model and is subtracted from the normal gravity. The model for the computation of the atmospheric correction is

$$AC = 8.74 - 0.00099.H + 0.0000000356.H^2 \quad (9)$$

Where,

AC = Atmospheric correction in gravity units

H = Elevation above the reference datum in metres

1.5.4 Free Air Correction

If the gravity station is located in height H above the reference surface, typically mean sea level, the free air reduction considers the decrease of gravity with increasing heights. If the earth is considered as a point mass, its gravity will decrease inversely with the square of the distance to the earth's centre of mass. The formula to calculate the magnitude of the reduction in practise is

$$g_{FA} = -\frac{2g}{r} H_s = -308.6 H\mu Gal = -0.3086\, HmGal \quad (10)$$

Where,

H = Station orthometric height in metres

g = Mean value of gravity (980500 mGal)

r = Mean radius of the Earth

1.5.5 Bouguer Correction

Free-air correction does not take into account the mass of rock between measurement station and sea level. The Bouguer correction, g_{FA}, accounts for the effect of the rock mass by calculating extra gravitational pull exerted by rock slab of thickness h and mean density ρ (Saibi, 2018). To compute the Bouguer correction, equation (11) (Nasuti *et al.,* 2010) is applied.

$$g_B = 2\pi G\rho H_s = 0.0419\,\rho H \text{ mGal} \quad (11)$$

Where,

ρ = Density = 2670 kg/m^3 (Märdla *et al.,* 2017)

G = Universal gravitational constant

H = Station orthometric height in metres

1.5.6 Elevation Correction

The combination of the free air and the Bouguer Corrections gives the elevation correction (g_{EC}). It is computed using

$$g_{EC} = -\left[\frac{2g}{r} - 2\pi G\rho\right] H_s mGal = -(0.3086 - 0.0419\,\rho) HmGal \quad (12)$$

1.5.7 Terrain Correction

The terrain correction accounts for variations in gravity values caused by variations in topography near the observation point. The correction accounts for the attraction of material above the assumed spherical cap and for the over-correction made by the Bouguer correction when in valleys. The terrain correction is positive regardless of whether the local topography

consists of a mountain or a valley (Mathews and McLean, 2015). The method of computing terrain corrections is very tedious. It requires the application of the software that makes use of digital terrain models (DTM) available from government or third-party sources.

1.6 Normal Gravity

The normal or theoretical gravity value at a geographic location is calculated using the assumption that the Earth is a regular homogeneous ellipsoid of rotation (the reference ellipsoid) (Murray and Tracey, 2001). Gravity values vary with latitude as the earth is not a perfect sphere and the polar radius is much smaller than the equatorial radius. The effect of centrifugal acceleration is also different at the poles versus the equator (Mathews and McLean, 2015). The closed-form of the Clarke 1880 ellipsoid Gravity Formula is used to approximate the theoretical gravity at each station location and essentially produce a latitude correction in this study. The model for the computation of theoretical gravity on the Clarke 1880 ellipsoid whose derivation details are given by Eteje *et al.* (2019) is

$$g_{TClarke1880} = 9.780519381\left[\frac{(1+0.00182202\ 113732433\ \sin^2\phi)}{(1-0.00680351\ 145465242\ \sin^2\phi)^{1/2}}\right]\text{ms}^{-2} \qquad (13)$$

Where,

$g_{TClarke1880}$ = Theoretical gravity on the Clarke ellipsoid

ϕ = Station latitude

1.7 Gravity Anomaly

The gravity anomaly Δg, is the difference between the observed gravity value (g) reduced to the geoid, and a normal, or theoretical, computed gravity value (γ_o) at the mean earth ellipsoid, where, the actual gravity potential on the geoid equal the normal gravity potential at the ellipsoid, at the projection of the same terrain point on the geoid and the ellipsoid respectively, that is (Dawod, 1998)

$$\Delta g = g - \gamma_o \qquad (14)$$

Considering the nature of the topography of the earth surface, which is irregular in shape, there are two basic types of gravity anomalies (free air and Bouguer anomalies).

1.7.1 Free Air Gravity Anomaly

Free air gravity anomaly is obtained by applying the free air correction to the difference between the observed gravity reduced to the geoid and the theoretical gravity computed on a specified ellipsoid. The model for the computation of the free air anomaly as given by Murray and Tracey (2001) is

$$\Delta g_{FA} = (g_{Obs} - \gamma_o + 0.3086H)\text{mGal} \qquad (15)$$

Where,

Δg_{FA} = Free air anomaly

g_{Obs} = Observed gravity

γ_o = Theoretical/Normal gravity

H = Orthometric height

1.7.2 Bouguer Gravity Anomaly

There are two types of Bouguer Gravity Anomaly: the simple and the complete Bouguer gravity anomalies. In simple Bouguer gravity anomaly computation, the topographic/terrain effect is not considered. The simple Bouguer gravity anomaly is obtained by applying the Bouguer correction only to the free air gravity anomaly. The model for the computation of the simple Bouguer gravity anomaly is given by Murray and Tracey (2001) as

$$\Delta g_{SB} = (\Delta g_{FA} - 0.0419\rho H)\text{mGal} \qquad (16)$$

Where,

Δg_{SB} = Simple Bouguer gravity anomaly

ρ = Density

The complete Bouguer gravity anomaly computation is done by applying the terrain correction to the simple Bouguer gravity anomaly. Mathews and

McLean (2015) gave the model for the computation of the complete Bouguer gravity anomaly as

$$\Delta g_{CB} = (\Delta g_{SB} + TC)\text{mGal} \quad (17)$$

Where,

Δg_{CB} = Complete Bouguer gravity anomaly

TC = Terrain correction

1.8 Kriging Method of Interpolation

Kriging is an interpolation method that can produce predictions of unobserved values from observations of its value at nearby locations. Kriging confers weights for each point according to its distance from the unknown value. Actually, these predictions treated as weighted linear combinations of the known values (Jassim and Altaany, 2013). Kriging method is more accurate whenever the unobserved value is closer to the observed values (Van-Beers and Kleijnen, 2003; Jassim and Altaany, 2013). The effectiveness of Kriging depends on the correct specification of several parameters that describe the semivariogram and the model of the drift (i.e., does the mean value change over distance). Because Kriging is a robust interpolator, even a naive selection of parameters will provide an estimate comparable to many other grid estimation procedures. According to Ozturk and Kilic (2016), the basic equation used in the Ordinary Kriging is

$$\hat{Z}(s_o) = \sum_{i=1}^{N} \lambda_i Z(s_i) \quad (18)$$

Where,

$Z(s_i)$ = Measured value at the ith location

λ_i = Unknown weight for the measured value at the ith location

(s_o) = Estimation location

N = Number of measured values

With Kriging method, the value $\hat{Z}(s_o)$ at the point s_o, where the true unknown value is $Z(s_o)$, is estimated by a linear combination of the values at N surrounding data points (Borga and Vizzaccaro 1996; Ozturk and Kilic, 2016). This study applies the kriging interpolation method to plot the gravity anomalies contour maps using Surfer 12 software.

1.9 Polynomial Interpolation

For the polynomial interpolation method, it is necessary to determine a polynomial that has the property to go through some data points by using different methods. This method is used to determine the general trend of the values of a polynomial function z = f (x, y) for a certain area. Polynomials can vary for the number of the degree, representing different geometric surfaces: a plane, a bilinear surface (etc.) quadrant area, a cubic surface, another appropriately defined area. In addition to the variables (x, y), the maximum power of the polynomial equation of these variables may represent other parameters (Dumitru *et al.,* 2013). The example of the use of the interpolation method in gravimetric study is that of Kaye (2012) who applied the polynomial interpolation method for interpolation of gravitational waveform. The general form of a spatial surface defined by a polynomial of order $n + m$ is (Dumitru *et al.,* 2013.

$$f(x,y) = a_{00} + a_{10}x + a_{01}y + a_{11}xy + a_{20}x^2 + a_{02}y^2 + a_{30}x^3 + a_{21}x^2y + a_{12}xy^2 + a_{03}y^3 + \ldots + a_{mn}x^m y^n \quad (19)$$

Where,

a_{mn} = Coefficients of the variables (x, y)

m = Degree of x the function f (x, y)

n = degree of the variable y of the function f (x, y)

Equation (19) is a polynomial of order $m + n$ which describes the tendency of a surface determined by a set of $m + n + 1$ points. According to Eteje *et al.* (2019), the accuracy of the polynomial surface is highest when the number of observation points is equal to the number of the model terms. Since 22 points were chosen and the fifth-degree polynomial surface has 22 terms, the fifth-degree polynomial model was chosen. The fifth-degree polynomial interpolation model given by Eteje *et al.* (2019) is

$$N = a_0 + a_1X + a_2Y + a_3XY + a_4X^2 + a_5Y^2 + a_6X^2Y^2 + a_7X^2Y + a_8XY^2 + a_9X^3 + a_{10}Y^3 + a_{11}X^3Y + a_{12}X^3Y^2 + a_{13}X^2Y^3 + a_{14}XY^3 + a_{15}X^4 + a_{16}Y^4 + a_{17}X^4Y + a_{18}XY^4 + a_{19}X^5 + a_{20}Y^5 \quad (20)$$

Where,

$Y = ABS(y - y_o)$

$X = ABS(x - x_o)$

y = Latitude of observed station

x = Longitude of observed station

y_o = Latitude of the origin (average of the Latitudes)

x_o = Longitude of the origin (average of the Longitudes)

1.10 Observation Equation Method of Least Squares Adjustment

The fitting of polynomial interpolation surface to a set of gravity data/anomalies requires the model parameters (variable coefficients) to be computed. The computation of these coefficients is done by observation equation method of least squares adjustment technique. The functional relationship between adjusted observations and the adjusted parameters as given by Eteje and Oduyebo (2018) is:

$$L_a = F(X_a) \quad (21)$$

Where, L_a = adjusted observations and X_a = adjusted parameters. Equation (21) is a linear function and the general observation equation model was obtained. The system of observation equations is presented by matrix notation as (Ono *et al.,* 2018):

$$V = AX - L \quad (22)$$

Where,

A = Design Matrix,

X = Vector of Unknowns

L = Observation Matrix.

V = Residual

The residual, V which is the difference between the estimate and the observation is usually useful when applying least squares adjustment technique for the determination of gravity anomaly interpolation model parameters since it is equal to the difference between the model gravity anomaly and the computed gravity anomaly of the points. So, it can be used as a check.

The unknown/model parameter is computed as

$$X = (A^T A)^{-1} A^T L \quad (23)$$

Where,

$(A^T A)^{-1}$ = Inverse of the normal matrix

The step by step procedures for the computation of the polynomial interpolation model Coefficients (a_{mn}) of the variables (x, y) are detailed in Eteje and Oduyebo (2018).

1.11 Reliability of the Model

The reliability/accuracy of the gravity interpolation model is obtained using the Root Mean Square Error, RMSE index. To evaluate the reliability of the model accuracy, the gravity anomalies of the points from the model are compared with their corresponding computed gravity anomalies from the processed gravity observations to obtain the gravity anomaly residuals. The gravity anomaly residuals and the total number of selected points are used for the computation of the RMSE, as well as the accuracy of the model. The Root Mean Square Error, RMSE index for the computation of the gravity interpolation model accuracy as given by Yilmaz and Kozlu (2018) is

$$RMSE = \pm\sqrt{\frac{1}{n}\sum_{i=1}^{n}\left(\delta\Delta g_{\text{Residual}}\right)^2} \quad (24)$$

Standard error (SE) is another measure of accuracy/reliability and it computed as

$$SE = \pm\sqrt{\frac{1}{n-1}\sum_{i=1}^{n}\left(\delta\Delta g_{\text{Residual}}\right)^2} \quad (25)$$

Where,

$\delta\Delta g_{\text{Residual}} = \Delta g_{\text{Computed}} - \Delta g_{\text{Model}})$

$\Delta g_{\text{Computed}}$ = Computed gravity anomaly

Δg_{Model} = Model gravity anomaly

n = Number of Points

II. METHODOLOGY

The adopted methodology is divided into station selection; data acquisition which consists of GNSS and gravity observations; data processing which comprises processing of the GNSS and the gravity observations and results presentation and analysis which also consists of the presentation and analysis of the processed GNSS and gravity observations.

2.1 Station Selection

A total of 22 points were used in the study. The points consisted: 1 reference station at the Benin City Airport whose absolute gravity value was known and 21 new points which were chosen along the major roads of the City. The roads which the chosen points affected are: Ring Road (RR), Sapele Road (SR), Airport Road (AR), Ekeuan Road (EK), Siluko Road (SLK), Mission Road (MR), Aduwawa Road (AD), First East Circular Road (UU), Urubi Road (UU), Uselu Road (UU), and Akpakpava-Agbor Road (AK) (see Figure 3). The chosen points also included 2 primary control stations (XSU92 located at Edo College and XSU100 located within the School of Nursing premises, along Sapele Road). The points were chosen knowing quite full well that their spatial distribution would not affect the accuracy of the models, opined by Oluyori and Eteje (2019).

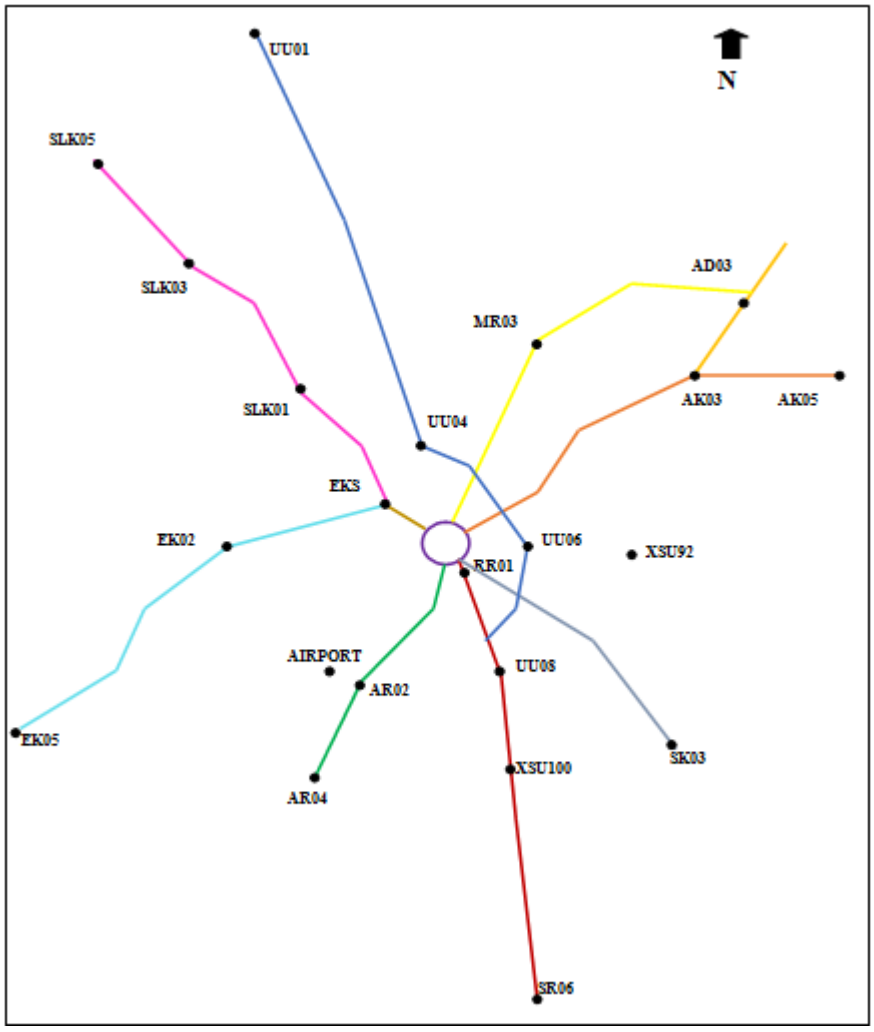


Figure 3: Selected/Observed Points Network (Not to Scale)

2.2 Data Acquisition

The data acquisition stage consisted of the GNSS and the gravity observations.

2.3 GNSS Observation

The GNSS observation was carried out using five CHC 900 dual frequency receivers to obtain the coordinates of the chosen points. During the observation, the base receiver was set at the first order control station (XSU 92) which was located at Edo College (see Figure 4) and the rover receivers were set at the new points (see Figure 5).

Figure 4: Base Receiver at Control Station XSU92

Figure 5: Rover Receiver at One of the Chosen Points at the Frontage of Central Baptist Church, Ring Road

2.4 Gravity Observation

The gravity observation was done to obtain the gravimetric data of the chosen points. The observation was carried out in seven different loops with SCINTREX CG-5 Autograv (The accuracy of the meter as given by Lederer (2009) is 2.1±1.1μGal). Each loop observation started from and closed on the reference station at the Benin City Airport (see Figures 6, 7 and 8). The observation was carried out by an expert (a Geophysicist from Mountain Top University, Ogun State).

Figure 6: Gravimeter at Reference Station (Benin City Airport)

Figure 7: Gravimeter at Control Station XSU92

Figure 8: Gravimeter at Station XSU100

2.5 Data Processing

The GNSS observations were processed using Compass Post-processing software in Minna datum to obtain the coordinates of the points. The gravity observations were processed using gravity processing software. The processing was also done by the Geophysicist to obtain the free air and the simple Bouguer gravity anomalies of the points. The normal gravity values of the points were computed using equation (13). The tide, drift, atmospheric, free air and Bouguer corrections were respectively computed using equations (7) to (11). The gravity anomalies were computed with equation (14) while the free air and the Bouguer gravity anomalies were respectively computed using equations (15) and (16)

2.6 Fitting of the Polynomial Interpolation Surface to the Computed Gravity Anomalies

The fifth-degree polynomial interpolation surface (equation (20)) was fitted to the free air and the Bouguer gravity anomalies to enable free air and Bouguer gravity anomalies of points within Benin City to be determined by interpolation. The fitting was done with least squares technique by computing the models (free air and Bouguer gravity anomalies models) parameters, as well as the variable coefficients using equation (23). The free air and the Bouguer gravity anomalies interpolation models parameters are computed as:

Free Air Gravity Anomalies Model Parameters

$$X_{FA} = \begin{pmatrix} a_o \\ a_1 \\ a_2 \\ a_3 \\ a_4 \\ a_5 \\ a_6 \\ a_7 \\ a_8 \\ a_9 \\ a_{10} \\ a_{11} \\ a_{12} \\ a_{13} \\ a_{14} \\ a_{15} \\ a_{16} \\ a_{17} \\ a_{18} \\ a_{19} \\ a_{20} \end{pmatrix} = \begin{pmatrix} 1098.24679 \\ -49100.62195 \\ -182388.88011 \\ 9577520.81692 \\ -605935.36770 \\ 14080886.81411 \\ -736667193.50972 \\ -359029386.02884 \\ -275295979.67158 \\ 128130100.53954 \\ -466538402.88725 \\ 7700378168.30738 \\ -6032715803\ 6.07167 \\ 9734499598\ 1.10212 \\ 8311609910.08958 \\ -3247514655.06618 \\ 5970315649.29619 \\ -3455033299\ 6.58047 \\ -1254374588\ 50.30718 \\ 2167422010\ 8.55918 \\ -1666154930\ 4.39348 \end{pmatrix}$$

Bouguer Gravity Anomalies Model Parameters

$$X_B = \begin{pmatrix} a_o \\ a_1 \\ a_2 \\ a_3 \\ a_4 \\ a_5 \\ a_6 \\ a_7 \\ a_8 \\ a_9 \\ a_{10} \\ a_{11} \\ a_{12} \\ a_{13} \\ a_{14} \\ a_{15} \\ a_{16} \\ a_{17} \\ a_{18} \\ a_{19} \\ a_{20} \end{pmatrix} = \begin{pmatrix} 720.88652 \\ -30490.57621 \\ -115672.55756 \\ 6052323.41734 \\ -431327.66735 \\ 8961465.06446 \\ -366547020.96524 \\ -227454549.21338 \\ -173367305.29814 \\ 82490912.01623 \\ -298262881.41882 \\ 4820674900.00641 \\ -4244413584\ 4.42169 \\ 6535968349\ 0.09077 \\ 5190244439.81705 \\ -2061419892.95478 \\ 3847676000.09322 \\ -1998634916\ 6.48964 \\ -8073523491\ 5.79854 \\ 1351268556\ 9.18198 \\ -1076361750\ 8.23694 \end{pmatrix}$$

The computed free air and Bouguer gravity anomalies model parameters, as well as the variable coefficient, were substituted accordingly into equation (20) and Microsoft Excel programs were developed for the two models. Using the two models, the free air and Bouguer gravity anomalies of the points were obtained by interpolation. And this is known as the model gravity anomaly.

The reliability, as well as the RMSE and the standard errors of the two models, were respectively computed using equations (24) and (25).

III. RESULTS PRESENTATION AND ANALYSIS

Figures 9 and 10 respectively show the contour plots of the computed and the model free air gravity anomalies. This was done to present graphically the fit of the polynomial surface to the computed free air gravity anomalies. The dependability of an interpolation model is its ability to reproduce exactly the values of the gravity anomalies of the points to which the surface was fitted. It can be seen from Figures 9 and 10 that the contour plots of the computed and the model free air gravity anomalies are truly identical in shape which implies the high degree of consistency of the model.

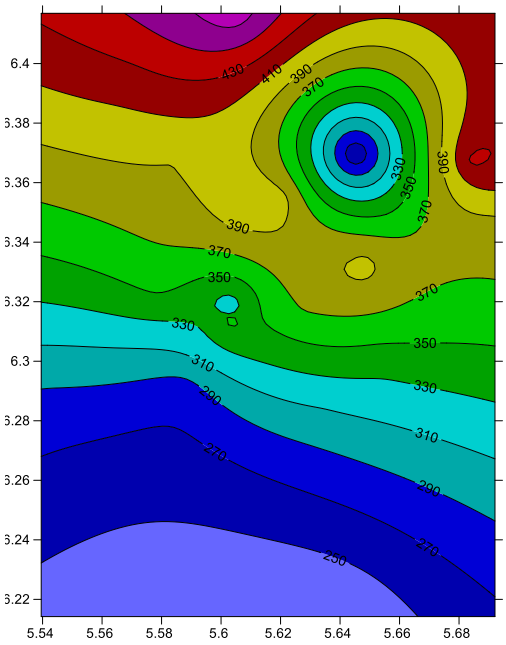


Figure 9: Contour Plot of Computed Free Air Gravity Anomalies

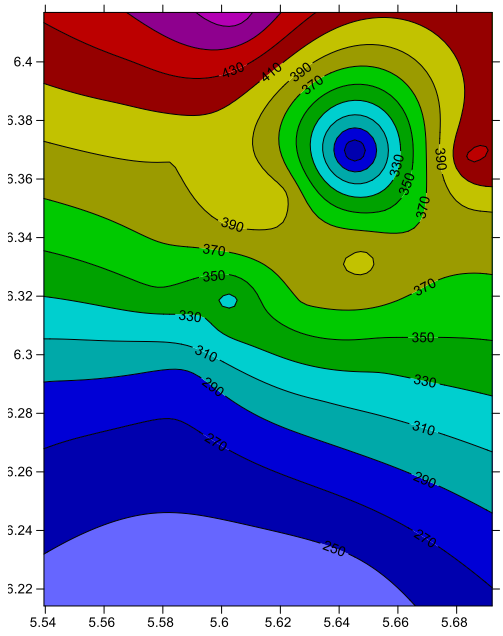
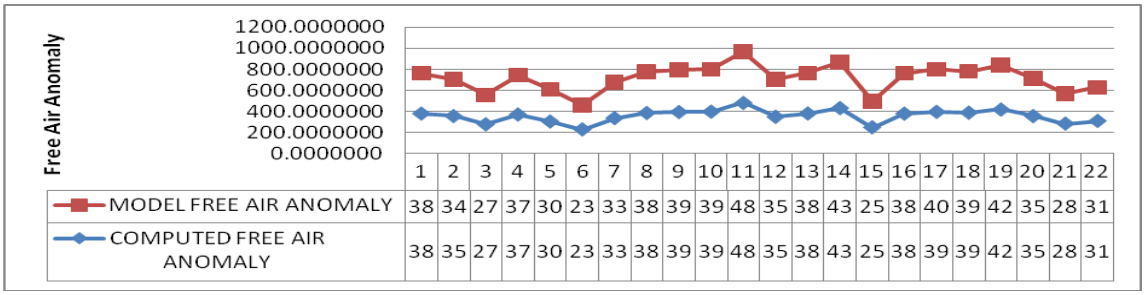


Figure 10: Contour Plot of Model Free Air Gravity Anomalies

Again, Figure 11 presents the plot of the computed and the model free air gravity anomalies of the chosen points. This was also done to show graphically the agreement between the computed and the model free air gravity anomalies, as well as the fit of the interpolation surface to the computed free air gravity anomalies. It can also be seen from Figure 11 that the plotted computed and the model free air gravity anomalies have identical shapes. This again shows the high dependability of the model.

Again, Figure 11 presents the plot of the computed and the model free air gravity anomalies of the chosen points. This was also done to show graphically the agreement between the computed and the model free air gravity anomalies, as well as the fit of the interpolation surface to the computed free air gravity anomalies. It can also be seen from Figure 11 that the plotted computed and the model free air gravity anomalies have identical shapes. This again shows the high dependability of the model.



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
MODEL FREE AIR ANOMALY	38	34	27	37	30	23	33	38	39	39	48	35	38	43	25	38	40	39	42	35	28	31
COMPUTED FREE AIR ANOMALY	38	35	27	37	30	23	33	38	39	39	48	35	38	43	25	38	39	39	42	35	28	31

Figure 11: Plot of the Computed and Model Free Air Gravity Anomalies

Figures 12 and 13 respectively present the contour plots of the computed and the model Bouguer gravity anomalies. This was also done to show graphically the fit of the polynomial surface to the computed Bouguer gravity anomalies. It can again be seen from Figures 12 and 13 that the contour plots of the computed and the model Bouguer gravity anomalies are truly identical in shape which implies the high degree of consistency of the model.

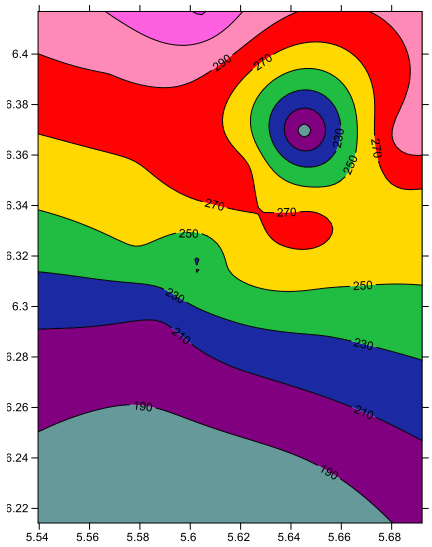


Figure 12: Contour Plot of Computed Bouguer Gravity Anomalies

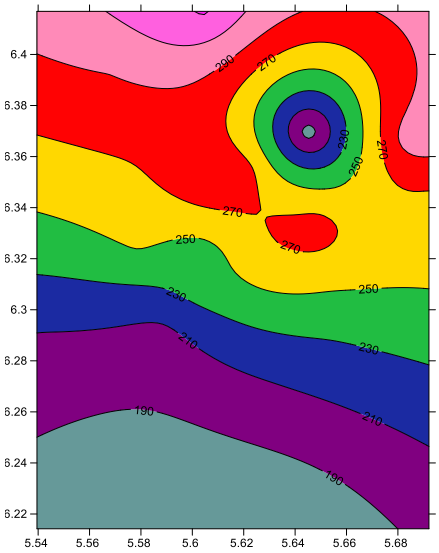


Figure 13: Contour Plot of Model Bouguer Gravity Anomalies

Also, Figure 14 presents the plot of the computed and the model Bouguer gravity anomalies of the observed points. This was as well done to show graphically the agreement between the computed and the model Bouguer gravity anomalies, as well as the fit of the interpolation surface to the computed Bouguer gravity anomalies. It can as well be seen from Figure 14 that the plotted computed and the model free air gravity

anomalies have identical shapes. This also shows the high reliability of the model.

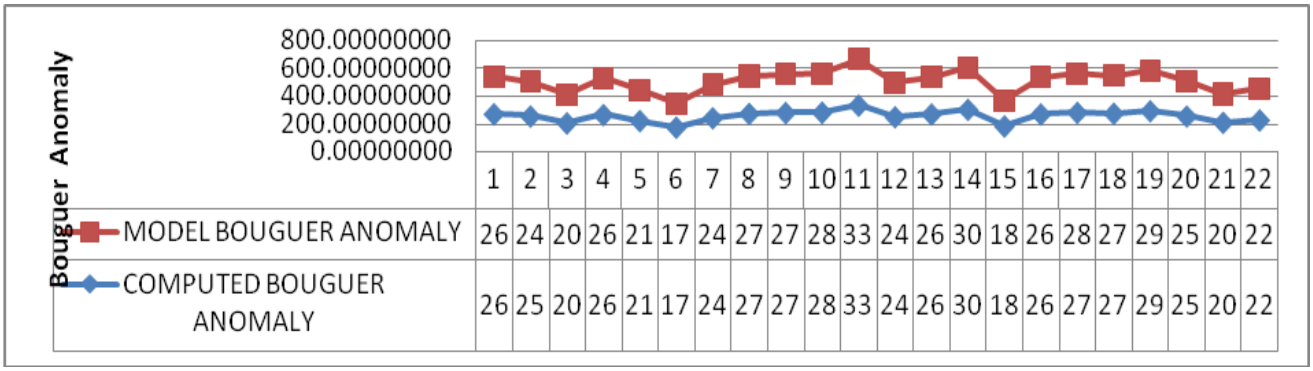


Figure 14: Plot of the Computed and Model Free Air Gravity Anomalies

Figure 15 presents the plot of the model free air and the Bouguer gravity anomalies. This was done to compare the shape of the surfaces of the two models. From Figure 15 it is seen that the surfaces of the two (free air and Bouguer gravity anomalies) models are identical in shape. This implies that the two models are representing the same terrain/topography.

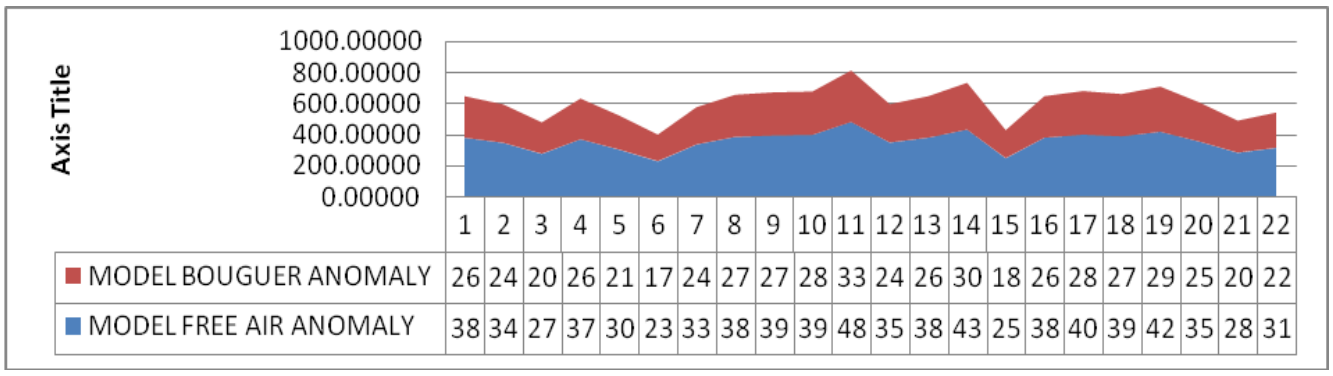


Figure 15: Plot of the Free Air and the Bouguer Model Gravity Anomalies

Table 3 presents the minimum and the maximum model free air and Bouguer gravity anomalies in mGal. This was done to present the ranges within which free air and Bouguer gravity anomalies can be determined by interpolation in Benin City using the two models. It can be seen from Table 3 that the minimum and the maximum model free air and Bouguer gravity anomalies are respectively 230.13943mGal and 483.43279mGal, and 171.82527mGal and 332.57248mGal. This implies that free air and Bouguer gravity anomalies can be respectively interpolated with the models within the ranges of 230.13943mGal to 483.43279mGal and 171.82527mGal to 332.57248mGal.

Table 3: Minimum and Maximum Model Free Air and Bouguer Gravity Anomalies

MODEL GRAVITY ANOMALY	MINIMUM (mGal)	MAXIMUM (mGal)
FREE AIR	230.13943	483.43279
BOUGUER	171.82527	332.57248

Table 4 shows the computed free air and Bouguer anomalies models RMSE and standard errors. This was done to present the reliability, as well as the accuracy of the two (free air and Bouguer) gravity anomaly interpolation models. From Table 4, it can be seen that the RMSE and the standard error of the free air gravity anomaly model are respectively 2.331mGal

$(2.331\times10^{-5}\,ms^{-2})$ and 2.385mGal $(2.385\times10^{-5}\,ms^{-2})$ while those of the Bouguer gravity anomaly model are respectively 1.453mGal $(1.453\times10^{-5}\,ms^{-2})$ and 1.487mGal $(2.331\times10^{-5}\,ms^{-2})$. The obtained accuracy for the two models agree with the ones achieved by Dawod (1998), Cattin *et al.* (2015), and Yilmaz and Kozlu (2018) in their studies. This shows the high reliability, as well as dependability of the models. The high reliability of the models resulted from the fifth-degree polynomial model, whose number of terms is equal to the of the observation points as detailed in Eteje *et al.* (2019).

Table 4: Computed Free Air and Bouguer Anomalies Models RMSE and Standard Errors

STATION	COMPUTED AND MODEL GRAVITY ANOMALY DIFFERENCE (mGal)		A^2	B^2
	FREE AIR (A)	BOUGUER (B)		
RR01	0.16912	0.10544	0.028601430	0.011118558
AR02	8.72075	5.43749	76.051422786	29.566283226
AR04	0.09730	0.06067	0.009467704	0.003681229
UU08	0.43494	0.27119	0.189168682	0.073544158
XSU100	0.02087	0.01302	0.000435669	0.000169512
SR06	0.00076	0.00048	0.000000583	0.000000227
SK03	-0.30792	-0.19199	0.094813842	0.036860377
UU06	0.30428	0.18972	0.092587916	0.035995433
XSU92	-0.24265	-0.15129	0.058876702	0.022889941
UU04	-0.06481	-0.04040	0.004199750	0.001632441
UU01	-0.00618	-0.00385	0.000038157	0.000014839
AK03	0.14182	0.08843	0.020113573	0.007820100
AK05	0.00178	0.00111	0.000003174	0.000001229
AD03	0.00973	0.00606	0.000094732	0.000036773
MR03	0.04358	0.02718	0.001899588	0.000738604
EKS	-0.25472	-0.15883	0.064884492	0.025225808
SLK01	-3.31756	-2.06854	11.006182692	4.278856636
SLK03	-0.00539	-0.00336	0.000029006	0.000011287
SLK05	-0.00145	-0.00090	0.000002098	0.000000814
EK02	-0.09774	-0.06094	0.009553030	0.003714245
EK05	-0.00156	-0.00097	0.000002422	0.000000946
AIRPORT	-5.64498	-3.51972	31.865790402	12.388395235
		RMSE (mGal) =	**2.331**	**1.453**
		STANDARD ERROR (mGal) =	**2.385**	**1.487**

IV. CONCLUSIONS AND RECOMMENDATIONS

Having considered the application of gravity data in various fields such as geodesy, geology, geophysics, engineering among others, the study has modelled the free air and Bouguer gravity anomalies of Benin City and made the following conclusions and recommendations.

1. The study has determined the gravity data of 22 points in Benin City from observed gravity measurements.
2. The obtained gravity data are termed local gravity anomalies as the theoretical gravity of the points were computed on the local ellipsoid (Clarke 1880 ellipsoid) adopted for geodetic computation in Nigeria.
3. It has also developed Microsoft Excel programs for the application of the models (free air and Bouguer gravity anomalies models) in the study area.
4. The computed Root Mean Square Errors (RMSEs) and the standard errors of the two models show high dependability, as well as the reliability of the models.
5. The study has recommended that whenever either free air or Bouguer gravity anomalies of points within Benin City are to be obtained for application in the field of geodesy, geology, geophysics and engineering, the determined models should be applied.
6. The study also recommends that in the application of the models in the study area, the local geographic coordinates of points of interest should be used.

V. REFERENCES

[1] Borga, M. and Vizzaccaro, A. (1996). On the Interpolation of Hydrologic Variables: Formal Equivalence of Multiquadratic Surface Fitting and Kriging. *J Hydrol,* Vol. 195, pp 160-171. In Ozturk, D. and Kilic, F. (2016). Geostatistical Approach for Spatial Interpolation of Meteorological Data. *Anais da Academia Brasileira de Ciências*, Vol. 88, No. 4, pp 2121-2136.

[2] Cattin, R., Mazzotti, S. and Laura-May Baratin, L. (2015). GravProcess: An Easy-to-Use MATLAB Software to Process Campaign Gravity Data and Evaluate the Associated Uncertainties. *Computers and Geosciences* Vol. 81, pp 20–27. DOI: 10.1016/j.cageo.2015.04.005.

[3] Dawod, D. M. (1998). A National Gravity Standardization Network for Egypt. Published Ph.D Dissertation of the Department of Surveying Engineering, Shoubra Faculty of Engineering, Zagazig University. https://www.academia.edu/794554/The_egyptian_national_gravity_standardization_network_ENGSN97_. Accessed 20th September, 2019.

[4] Dumitru, P. D., Plopeanu, M. and Badea, D (2013). Comparative Study Regarding the Methods of Interpolation. Recent Advances in Geodesy and Geomatics Engineering, pp 45-52. https://pdfs.semanticscholar.org/613c/25d7de55dff3d099706f6b7c9f11acf77ad5.pdf. Accessed 25 September, 2019.

[5] Eteje S. O., Oduyebo O. F. and Ono M. N. (2019). Derivation of Theoretical Gravity Model on the Clarke 1880 Ellipsoid for Practical Local Geoid Model Determination. *Scientific Research Journal (SCIRJ)*, Vol. 7 No. 2, pp 12-19. DOI: 10.31364/SCIRJ/v7.i2.2019.P0219612.

[6] Eteje, S. O. and Oduyebo, F. O. (2018). Local Geometric Geoid Models Parameters and Accuracy Determination Using Least Squares Technique. *International Journal of Innovative Research and Development (IJIRD),* Vol. 7, No 7, pp 251-257. DOI: 10.24940/ijird/2018/v7/i7/JUL18098.

[7] Eteje, S. O., Oduyebo, O. F. and Oluyori, P. D. (2019). Relationship between Polynomial Geometric Surfaces Terms and Observation Points Numbers and Effect in the Accuracy of Geometric Geoid Models. International *Journal of Environment, Agriculture and Biotechnology (IJEAB),* Vol. 4, No. 4, pp 1181-1194. DOI: 10.22161/ijeab.4444.

[8] Ismail, N. H. (2015). Gravity and Magnetic Data Reduction Software (GraMag2DCon) for Sites Characterization. Published Ph.D Dissertation

of the Universiti Sains Malaysia. http://eprints.usm.my/31969/1/NOER_EL_HIDAYAH_ISMAIL.pdf. Accessed 25 September, 2019.

[9] Jassim, F. A. and Altaany, F. H. (2013). Image Interpolation Using Kriging Technique for Spatial Data. *Canadian Journal on Image Processing and Computer Vision*, Vol. 4, No. 2, pp 16-21.

[10] Kaye, J. (2012). The Interpolation of Gravitational Waveforms. Published Thesis of the Division of Applied Mathematics, Brown University. https://www.brown.edu/research/projects/scientific-computing/sites/brown.edu.research.projects.scientific-computing/files/uploads/The%20interpolation.pdf. Accessed 25 September, 2019.

[11] Lederer, M. (2009). Accuracy of the Relative Gravity Measurement. *Acta Geodyn. Geomater.*, Vol. 6, No. 3, pp 383-390.

[12] Märdla, S., Ågren, J., Strykowski, G., Oja, T., Ellmann, A., Forsberg, R., Bilker-Koivula, M., Omang, O., Paršelinas, E. and Liepinš, I. (2017). From Discrete Gravity Survey Data to a High-resolution Gravity Field Representation in the Nordic-Baltic Region. *Marine Geodesy*, Vol. 40, No. 6, pp 416-453. DOI: 10.1080/01490419.2017.1326428.

[13] Mariita, N. O. (2009). The Gravity Method. Proceedings of Short Course IV on Exploration for Geothermal Resources, organized by UNU-GTP, KenGen and GDC, at Lake Naivasha, Kenya.

[14] Mathews, L. R., and McLean, M. A. (2015). Gippsland Basin Gravity Survey. Geological Survey of Victoria Technical Record. https://earthresources.vic.gov.au/__data/assets/pdf_file/0011/456743/G6-Gippsland-gravity-survey-report-June-2015.pdf. Accessed 20th September, 2019.

[15] Mickus, K. (2004). Gravity Method: Environmental and Engineering Applications. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.522.2552&rep=rep1&type=pdf. Accessed 20th September, 2019

[16] Murray, A. S. and Tracey, R. M. (2001). Best Practice in Gravity Surveying. Australian Geological Survey Organization. https://d28rz98at9flks.cloudfront.net/37202/37202.pdf. Accessed 20th September, 2019.

[17] Nasuti, A., Beiki, M. and Ebbing, J. (2010). Gravity and magnetic data acquisition over a segment of the Møre-Trøndelag Fault Complex. Geological Survey of Norway NO-7491 Trondheim, Norway.

[18] Oluyori, P. D. and Eteje, S. O. (2019). Spatial Distribution of Survey Controls and Effect on Accuracy of Geometric Geoid Models (Multi-quadratic and Bicubic) in FCT, Abuja. *Scientific Research Journal (SCIRJ),* Vol. 7, No. 5, pp 29-35. DOI: 10.31364/SCIRJ/v7.i5.2019.P0519650.

[19] Ono, M. N., Eteje, S. O. and Oduyebo, F. O. (2018). Comparative Analysis of DGPS and Total Station Accuracies for Static Deformation Monitoring of Engineering Structures. *IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT),* Vol. 12, No. 6, PP 19-29. DOI: 10.9790/2402-1206011929.

[20] Ozturk, D. and Kilic, F. (2016). Geostatistical Approach for Spatial Interpolation of Meteorological Data. *Anais da Academia Brasileira de Ciências,* Vol. 88, No. 4, pp 2121-2136.

[21] Saibi, H. (2018). Microgravity and Its Applications in Geosciences. Gravity-Geoscience Applications, Industrial Technology and Quantum Aspect. DOI: 10.5772/intechopen.71223.

https://cdn.intechopen.com/pdfs/57238.pdf. Accessed 20th September, 2019.

[22] SpongIer, D. P. and Libby, F. J. (1968). Application of the Gravity Survey Method to Watershed Hydrology. *Issue of Ground Water*, Vol. 6, No. 6.

[23] Valenta, J. (2015). Introduction to Geophysics – Lecture Notes. Czech Republic Development Cooperation. http://www.geology.cz/projekt681900/english/learning-resources/Geophysics_lecture_notes.pdf

[24] Van-Beers, W. C. M. and Kleijnen, J. P. C. (2003). Kriging for Interpolation in Random Simulation. *Journal of the Operational Research Society*, Vol. 54, pp. 255–262. In Jassim, F. A. and Altaany, F. H. (2013). Image Interpolation Using Kriging Technique for Spatial Data. *Canadian Journal on Image Processing and Computer Vision,* Vol. 4, No. 2, pp 16-21.

[25] Yilmaz, M. and Kozlu, B. (2018). The Comparison of Gravity Anomalies based on Recent High-Degree Global Models. *Afyon Kocatepe University Journal of Science and Engineering,* Vol. 18, pp 981-990.

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Characterization of Wear Properties of Epoxy- SiC- Alumina Filled Polymer Matrix Composites

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ABSTRACT

Nowadays, Polymer composites are frequently used for engineering applications such as aerospace, automotive and marine industries. The present research is on evaluation of wear properties of epoxy resin composite fabricated using alumina (Al2O3) in 5wt% and Silicon Carbide (SiC) in 5-15 wt% in steps of 5 wt% as fillers for testing purpose. The tribological properties such as dry sliding wear characteristics have been evaluated by conducting wear tests using Pin-on-Disc wear testing setup for sliding speed (200/300/400 rpm) and sliding load (20/30/40 N). The wear properties are analyzed using Taguchi's Design of Experiments and Analysis of Variance (ANOVA) techniques. From the statistical analysis it is found that the 15wt% of SiC is major factor influencing the wear resistance of the composite material. Finally regression analysis has been carried out to build regression model to predict the wear rate of the composite material under different sliding conditions.

Keywords : Alumina, Silicon Carbide, Taguchi's, ANOVA

I. INTRODUCTION

The fast grooving technology has created demand for newer materials particularly for structural applications which has improved physical and mechanical properties and which can be performed at highly corrosive environment, high temperature and pressure. Composites are the materials of choice, which are basically multifunctional materials having unprecedented physical and mechanical properties that can be tailored to meet the requirements of a particular application. There has been a tremendous achievement in the science and technology of composite material in recent times [1]. These materials have greatly improved since the 1970s and their use has expanded rapidly in the world of industry. Their contribution is essential to different leading industry sectors. They are used because of their low mass and exceptional performance. Many composites used today are at the leading edge of materials technology with performance and costs justifying their ultra- demanding applications [2].

Among the thermosetting polymers, epoxy resins are the most widely used for high-performance applications such as, matrices for fiber reinforced composites, structural adhesive, coating and other engineering applications. Epoxy resins are characterized by excellent mechanical and thermal properties, high chemical, and corrosion resistance, low shrinkage on curing and the ability to be processed under a variety of conditions [3].

Rajesh et al. [4] fabricated the epoxy and polyester resin composites mixing aluminum oxide, silicon carbide with silicon carbide with different proportion of Al_2O_3 and SiC along with GFRP. SiC remains one of the most explored conventional reinforcement for the development of AMCs [5]. Its suitability for weight saving structural and tribological applications, and appeal as coatings in metal substrates and heat sink components in microelectronics and electronic packaging applications [6–8] has helped to preserve it as first choice reinforcement material for AMCs. However, its relatively prohibitive cost and limited availability remain some concerns from a third world perspective.

Now-a-days specific fillers/additives are to enhance and modify the quality of composites as these are found to play a major role in determining the physical properties and mechanical behavior of the composites. For many industrial applications of filler reinforced epoxy composites are in use. Information about their mechanical behavior is great importance. Therefore, this work presents an experimental study of the evaluation of wear behavior of SiC-alumina filled polymer matrix composites.

II. MATERIAL AND METHODS

Composites are made of reinforcing fibers or fillers and matrix materials. Matrix surrounds the fibers and thus protects those fibers against chemical and environmental attack.

The matrix material system selected is an Epoxy resin (LAPOX L-12 with density 1.16 g/cm^3) supplied by Suntech Fibers, Bangalore, India. The two fillers chosen were Silicon- (SiC) and aluminum oxide (Al2O3). The average particle size of SiC and Al2O3 micro particles are about 10 μm size.

A. COMPOSITE FABRICATION

The fabrications of all composite specimens used in this work were manufactured by "Casting and Curing" technique. The process of manufacturing a composite product has been split into a number of different stages. Fabrication is done by mixing a measured amount of pure epoxy resin to a known amount of hardener in the ratio of 10:1.2 with gentle stirring to minimize formation of air bubbles. A releasing agent is used to facilitate easy removal of the composite from the mould after curing. The epoxy is mixed with calculated weight percentage of SiC and Al_2O_3 with constant stirring. Then the mixture is poured into the moulds. Then the cast of each composite after 12 hr of impregnation and dried for 2 hr at 100° C in an oven after curing. The epoxy is mixed with calculated weight percentage of SiC and Al2O3 with constant stirring. Then the mixture is poured into the moulds. Then the cast of each composite after 12 hr of impregnation and dried for 2 hr at 100o C in an oven. Specimens of suitable dimension are cut for physical characterization and mechanical testing. Utmost care has been taken to maintain uniformity and homogeneity of the composite. All composite samples with particulate fillers of fixed weight percentage are fabricated by the same technique. Composites having 0%SiC-5%Al_2O_3, 5%SiC-5%Al_2O_3, 10% SiC-5% Al2O3 and 15% SiC-5% Al_2O_3 are fabricated and prepared for conducting mechanical testing.

III. RESULT AND DISCUSSION

A. Evaluation of Wear Properties using Taguchi Method

The Taguchi technique is a powerful design of experiment tool for acquiring the data in a controlled way and to analyze the influence of process variable

over some specific variable which is unknown function of these process variables and for the design of high quality systems. This method was been successfully used by many researchers in the study of wear behavior of aluminum metal matrix composites [9-15]. Taguchi creates a standard orthogonal array to accommodate the effect of several factors on the target value and defines the plan of experiment. The Taguchi method, which is effective to deal with responses, was influenced by multi-variables. This method drastically reduces the number of experiments that are required to model the response function compared with the full factorial design of experiments. The major advantage of this technique is to find out the possible interaction between the parameters. The Taguchi technique is devised for process optimization and identification of optimal combination of the factors for a given response. This technique is divided into three main phases, which encompasses all experimentation approaches. The three phases are:

1) The planning phase
2) The conducting phase
3) The analysis phase

Planning phase is the most important phase of the experiment. This technique creates a standard orthogonal array to accommodate the effect of several factors on the target value and defines the plan of experiments. The experimental results are analyzed using analysis of means and variance to study the influence of factors.

TABLE I. FACTORS AND THEIR LEVELS

Symbol	Factor	Level 1	Level 2	Level 3
L	Normal Load (N)	20	30	40
S	Sliding Speed (rpm)	200	300	400
F	SiC content (Wt %)	5	10	15

TABLE II. L27 (313) ORTHOGONAL ARRAY OF TAGUCHI

Trail	1	2	3	4	5	6	7	8	9	10	11	12	13
1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	1	1	1	1	2	2	2	2	2	2	2	2	2
3	1	1	1	1	3	3	3	3	3	3	3	3	3
4	1	2	2	2	1	1	1	2	2	2	3	3	3
5	1	2	2	2	2	2	2	3	3	3	1	1	1
6	1	2	2	2	3	3	3	1	1	1	2	2	2
7	1	3	3	3	1	1	1	3	3	3	2	2	2
8	1	3	3	3	2	2	2	1	1	1	3	3	3
9	1	3	3	3	3	3	3	2	2	2	1	1	1
10	2	1	2	3	1	2	3	1	2	3	1	2	3
11	2	1	2	3	2	3	1	2	3	1	2	3	1
12	2	1	2	1	3	1	2	3	1	2	3	1	2
13	2	2	3	1	1	2	3	2	3	1	3	1	2
14	2	2	3	1	2	3	1	3	1	2	1	2	3
15	2	2	3	2	3	1	2	1	2	3	2	3	1
16	2	3	1	2	1	2	3	3	2	1	2	1	1
17	2	3	1	2	2	3	1	1	2	3	3	2	2
18	2	3	1	2	3	1	2	2	3	1	1	3	3
19	3	1	3	2	1	3	2	1	3	2	1	3	2
20	3	1	3	2	2	1	3	2	1	3	2	1	3
21	3	1	3	2	3	2	1	3	2	1	3	2	1
22	3	2	1	3	1	3	2	2	1	3	3	2	1

23	3	2	1	3	2	1	3	3	2	1	1	3	2
24	3	2	1	3	3	2	1	1	3	2	2	1	3
25	3	3	2	1	1	3	2	3	2	1	2	1	3
26	3	3	2	1	2	1	3	1	3	2	3	2	1
27	3	3	2	1	3	2	1	2	1	3	1	3	2
	A	B	A X B	A X B	C	A X C	A X C	B X C	D	A X D	B X C	B X D	C X D

In the present investigation, an L27 orthogonal array was selected and it has 27 rowsand 13 columns. The selection of the orthogonal array is based on the condition that the degrees of freedom for the orthogonal array should be greater than, or equal to the sum of the variables. Each variable and the corresponding interactions were assigned to a column defined by Taguchi method. In the study of prediction of wear rate of the composite materials is carried out by selecting load (L), sliding speed (S) and wt% of SiC (Si) as control variables. The control variables and their levels are shown in table 3.1 and table 3.2 shows the standard L27 orthogonal array. The first column was assigned to load (L), the second column to sliding speed (S), the fifth column to SiC content (Si), and the remaining columns were assigned to their interactions. The response variable to be studied is wear rate. The experiments were conducted based on the rank order generated by Taguchi model and the results were obtained. The analysis of the experimental data was carried out using MINITAB 15 software, which is specially used in DOE applications. The experimental results were transformed into a signal to-noise (S/N) ratios. S/N ratio is defined as the ratio of the mean of the signal to the standard deviation of the noise. The S/N ratio indicates the degree of the predictable performance of a product or process in the presence of noise factors. The S/N ratio for wear rate is calculated using 'smaller the better' characteristic, which can be calculated as a logarithmic transformation of the loss function, and is given in the equation 3.1.

$$\frac{S}{N} = -10 \log 1/n \, (\Sigma y^2) \qquad (3.1)$$

Where, y is the observed data (wear rate) and n is the number of observations. The above S/N ratio transformation is suitable for minimization of wear rate. The experiments were conducted as per orthogonal array and the wear rate results obtained for various combinations of parameters are shown in Table 3.2. The experimental values were transformed into S/N ratios for measuring the quality characteristics using MINITAB 15. The S/N ratio obtained from all the experiments are shown in Table 3.3.

TABLE III.
WEAR RATE AND S/N RATION OBTAINED AS PER TAGUCHI'S L27 ORTHOGONAL ARRAY

Sl No.	load, N(L)	Speed, m/s (S)	SiC, wt% (Si)	Wear Rate Kg/m X 10^{-5}	S/N Ratio
1	20	1.05	3	3.0867	-9.78989
2	20	1.05	6	3.0194	-9.59841
3	20	1.05	9	3.0113	-9.57508
4	20	1.83	3	4.2575	-12.5831
5	20	1.83	6	3.786	-11.5636
6	20	1.83	9	3.585	-11.0898
7	20	2.62	3	4.4717	-13.0089
8	20	2.62	6	3.7923	-11.5781
9	20	2.62	9	3.6887	-11.3375
10	20	1.05	3	4.6403	-13.3309
11	20	1.05	6	3.8332	-11.6711
12	20	1.05	9	3.1752	-10.0354
13	20	1.83	3	5.3261	-14.5282
14	20	1.83	6	4.7157	-13.4709
15	20	1.83	9	3.869	-11.752
16	20	2.62	3	5.592	-14.9513
17	20	2.62	6	5.2443	-14.3938
18	20	2.62	9	4.5606	-13.1804
19	20	1.05	3	5.568	-14.914
20	20	1.05	6	4.7185	-13.4761
21	20	1.05	9	4.5796	-13.2166
22	20	1.83	3	6.4175	-16.1473
23	20	1.83	6	5.6392	-15.0243
24	20	1.83	9	5.3352	-14.543
25	20	2.62	3	6.5245	-16.2909
26	20	2.62	6	6.3447	-16.0482
27	20	2.62	9	5.498	-14.8041

A. S-N Ratio Analysis

The influence of control parameters such as load, sliding speed and SiC content on wear rate has been evaluated using S/N ratio response analysis. The control parameter with the strongest influence was determined by the difference between the maximum and minimum value of the mean of S/N ratios. Higher the difference between the mean of S/N ratios, the more influential was the control parameter. The S/N ratio response analysis, presented in Table 3.4 shows that among all the factors, load was the most influential and significant parameter followed by sliding speed and SiC content. Figure 3.1 shows the mean of wear rate graphically and figure 3.2 depicts the main effects plot for means of S/N ratio for wear rate. From the analysis of these results, it can be inferred that parameter combination of L = 20 N, S = 200 rpm and Si = 15% gave the minimum wear rate for the range of parameters tested.

TABLE IV. RESPONSE TABLE FOR S/N RATIOS - SMALLER IS BETTER (WEAR RATE)

Level	Load	Speed	SiC
1	3.633	3.959	5.098
2	4.551	4.77	4.566
3	5.625	5.08	4.145
Delta	1.992	1.12	0.953
Rank	1	2	3

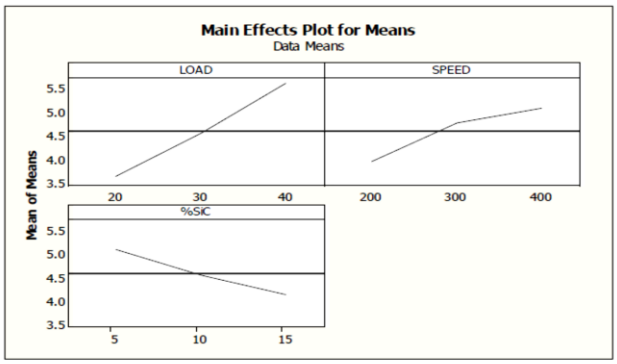

Figure 1: Main Effects plot for Means

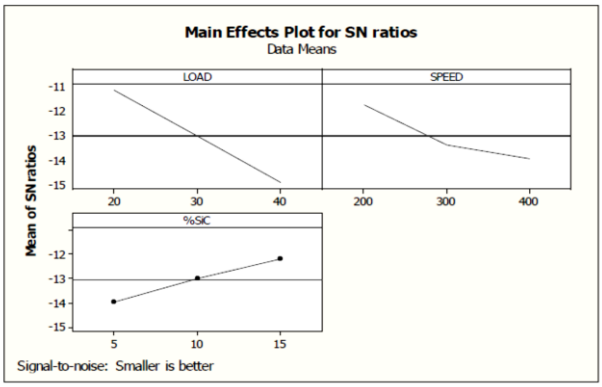

Figure 2: Main Effects plot for S-N Ratios

B. ANOVA and Effects of Parameters on Wear Rate

Analysis of Variance (ANOVA) was used to determine the design parameters significantly influencing the wear rate (response). The table shows the results of ANOVA for wear rate. This analysis was evaluated for a confidence level of 95%, that is for significance level of α=0.05. The last column of Table 3.5 shows the percentage of contribution (P %) of each parameter in the response, indicating the degree of influence on the result.

TABLE V. ANOVA RESULTS FOR WEAR RATE

Source	*DF*	*Seq SS*	*Adj SS*	*Adj MS*	*F*	*P*	*P(%)*
Load, N(L)	*2*	*17.8907*	*17.89*	*8.945*	*209.230*	*0.00*	*61.38*
Speed m/s (S)	*2*	*6.026*	*6.026*	*3.013*	*70.480*	*0.00*	*20.68*
SiC,wt% (SI)	*2*	*4.109*	*4.109*	*2.054*	*48.060*	*0.00*	*14.10*
L X S	*4*	*0.129*	*0.129*	*0.032*	*0.760*	*0.58*	*0.45*
L X Si	*4*	*0.555*	*0.555*	*0.138*	*3.250*	*0.07*	*1.90*

S X Si	*4*	*0.091*	*0.091*	*0.023*	*0.540*	*0.71*	*0.32*
Residual Error	*8*	*0.342*	*0.342*	*0.042*			
Total	*26*	*29.14*					

Notes: DF, degree of freedom: SeqSS, Sequential sum of squares; Adj SS, Adjusted sum of squares; Adj MS, Adjusted mean squares; P, Percentage of contribution. S=0.2398 R-Sq=98.8% R-Sq(adj)=96.2%

It can be observed from the results obtained in the Table 3.5, that load was the most significant parameter having the highest statistical influence (61.38%) on the dry sliding wear of composites followed by sliding speed (20.68%) and SiC content (14.10%). When the P value for this model was less than 0.5, then the parameter or interaction can be considered as statistically significant. This is desirable as it demonstrates that the parameter or interaction in the model has a significant effect on the response. From an analysis of the results obtained in Table 3.3, it is observed that the load (L), sliding speed (S), SiC content (Si), the interaction effect of load with SiC content (L* Si) is significant model terms influencing wear rate of composites, since they have obtained the P - value < 0.5. Although the interaction effect of load with sliding speed (L*S) exerts some influence on the dry sliding wear, it may be considered statistically insignificant for its P-value is greater than 0.5, and hence it is neglected. The coefficient of determination (R2) is defined as the ratio of the explained variation to the total variation. It is a measure of the degree of fit. When R2 approaches unity, a better response model results and it fits the actual data. The value of R2 calculated for thismodel was 0.988, i.e., very close to unity, and thus acceptable. It demonstrates that 98.8% of the variability in the data can be explained by this model. Thus, it is confirmed that this model provides reasonably good explanation of the relationship between the independent factors and the response. Statistical analysis is carried out for composite specimens having e-glass fiber in different wt%. Similar analysis is repeated for composites containing 3 wt%, 6 wt% and 9 wt% of e-glass fiber reinforced aluminum SiC composite materials and effect of different control variables on the wear rate of composites is analyzed using ANOVA.

C. Worn surface morphology

To correlate the wear data effectively, SEM micrographs of worn surfaces of Epoxy Composite samples are shown in figure 3.3 to figure 3.5. Several mechanisms have been proposed to explain how material is removed from the surface during abrasion. Because of the complexity of abrasion, no one mechanism completely contributes to all the wear loss. In general, the abrasive wear process involves four different mechanisms namely microploughing, micro cutting, micro fatigue and micro cracking. Using SEM micrographs it is possible to identify qualitatively the dominant wear mechanisms under abrasion. Figure 5.7 to 5.9 show SEM micrograph of epoxy composite samples abraded during wear test. Figure 5.7 to 5.9 shows some ploughing marks on the surface, matrix damage and exposure of SiC. The matrix is heavily damaged by ploughing and cutting action by the higher sized SiC particles. The SEM micrograph also indicates the crack propagation of the matrix, deterioration of the matrix adhesion due to repetitive mechanical stress and some SiC pull-out from the matrix is also visible.

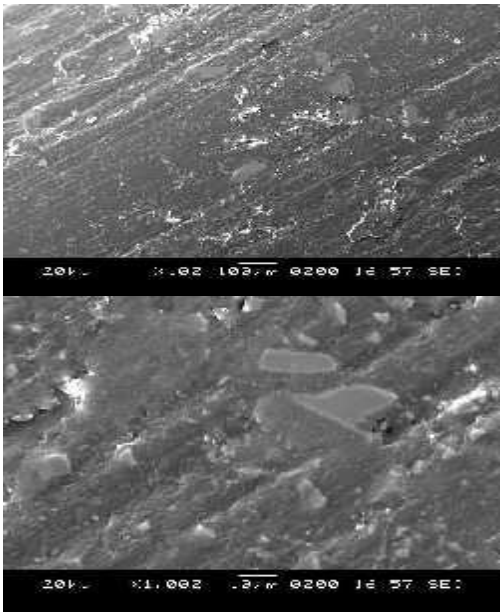

Figure 3: SEM Micrographs of 5wt% Al2O3 and 5wt% SiC Epoxy Composite

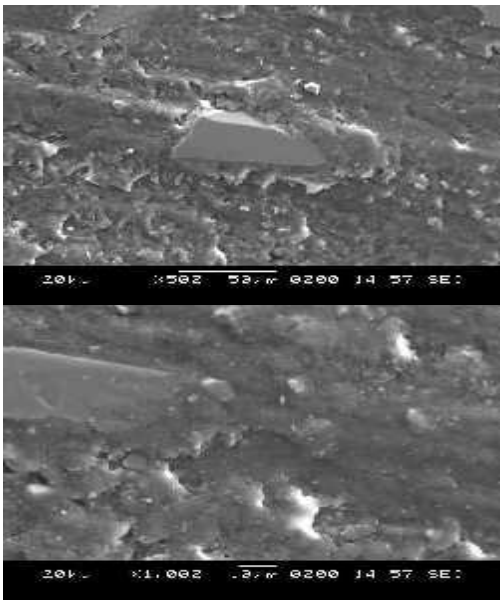

Figure 4: SEM Micrographs of 5wt% Al2O3 and 10wt% SiC Epoxy Composite

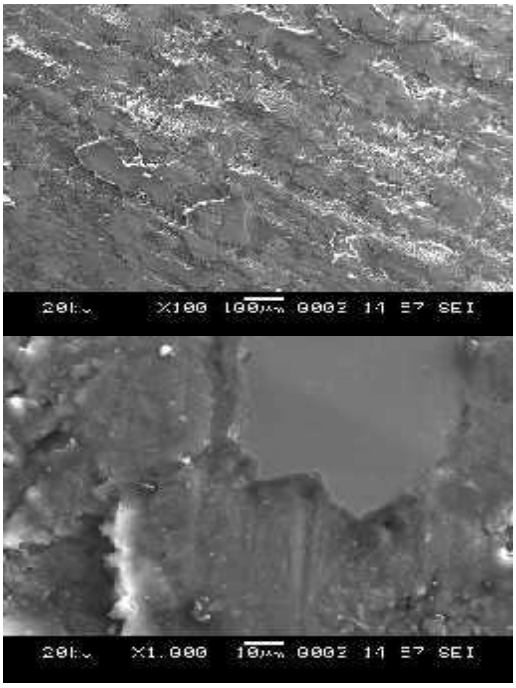

Figure 5: SEM Micrographs of 5wt% Al2O3 and 15wt% SiC Epoxy Composite

IV. CONCLUSION

The following conclusions can be made by the study of SiC and Al_2O_3 filled epoxy polymer matrix composites:

a. Wear rate decreases with increasing abrading distance and grit size. Further, the wear volume increases with increasing abrading distance. Al2O3 filled composite showed better abrasion resistance as compared to that of unfilled composites.
b. There has been an observed marked improvement in wear resistance as seen in Al2O3 and SiC filled composite sample. Higher wear resistance was noticed for 5 wt. % of Al2O3 and 15 wt% SiC filled composite than unfilled composites.
c. SEM micrographs revealed that the microploughing and micro cutting are the dominant wear mechanisms characterized by the

formation of deep grooves with extruded filaments of matrix at the edges of the grooves.

V. REFERENCES

[1]. Das, B. Sahu, S.K. Ray, B.C. "Effects of Matrix types and Loading speed on the failure behaviour of FRP Composite" ISTAM 2004, NIT, Rourkela, India, Dec 27-30,p24-32.

[2]. Boukhoulda, B.F. Adda-Bedia, E. Madani, K "The effect of fiber orientation angle in composite materials on moisture absorption and material degradation afterhygrothermal ageing" Composite Structures 74(2006)p 406-418.

[3]. Nishar Hammed. P.A. Sreekumar, Bejoy Francis, Weimin Yang, Sabu Thomas, Morphology, dynamic mechanical and thermal studies on poly (styrene-coacrylonitrile) modified epoxy resin/glass fibre composite, composites: part A, 38, 2008, 2422-2432.

[4]. Rajesh AM, Kaleemulla M and Saleemsab D. Effect of addition of SiC and Al2O3 on wear behavior of hybrid aluminum metal matrix composites. Acta Technica Corvin Bull Eng 2019; 12(1): 43-52.

[5]. Alaneme KK, Sanusi KO. Mechanical and wear behaviour of rice husk ash- alumina-graphite hybrid reinforced aluminium based composites. Eng Sci Technol Int J 2015; 18:416-22.

[6]. Kumar S, Reddy SK, Joshi SV. Microstructure and performance of cold sprayed Al-SiC composite coatings with high fraction of particulates. Surf Coat Technol 2017;318:62-71.

[7]. Zhang L, Xu H, Wang Z, Li Q, Wu J. Mechanical properties and corrosion behavior of Al/SiC composites. J Alloy Compd 2016;678:23-30.

[8]. Teng F, Yu K, Luo J, Fang H, Xiong H. Microstructures and properties of Al-50% SiC composites for electronic packaging applications. Trans Nonferrous Metals Soc China 2016;26:2647-52.

[9]. Radhika N, Subramanian R and Venkat Prasat S. Tribological behaviour of aluminium/alumina/graphite hybrid metal matrix composite using Taguchi's techniques. J Min Mater Character Eng 2011; 10(5): 427-443.

[10]. Radhika N, Subramanian R, Venkat Prasat S, et al. Dry sliding wear behaviour of aluminium/alumina/graphite hybrid metal matrix composites. J Indust Lubricat Tribol 2012; 64(6): 359-366.

[11]. Doddamani S, Kaleemulla M, Begum Y, et al. An investigation on wear behavior of graphite reinforced aluminum metal matrix composites. JoRSTEM 2017; Sp Issue:NCETERM- 2017: 1-6.

[12]. Vencl A, Bobic I, Arostegui S, et al. Structural, mechanical and tribological properties of A356 aluminium alloy reinforced with Al2O3, SiC and SiC, graphite particles. J Alloy Compd 2010; 506: 631-639.

[13]. Sawla S and Das S. Combined effect of reinforcement and heat treatment on the two body abrasive wear of aluminium alloy and aluminium particle composites. 2004; 257(5-6) 555-561. Gomes EG and Rossi. Heat Treatment Effect on Spray Formed Al/SiC Composite. Key Engg. Materials. 2001; 189-191: 496-502.

[14]. Singh N, Shweta G and Khanna K. Effect of thermal ageing on al alloy metal matrix composite. ME Thesis, Department of Mechanical Engineering, Thapar University, Patiala, India, July 2010.

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Characteristic of Protein Hydrolyzate Starch of Snakehead Fish (*Channa Striata*) Head

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ABSTRACT

The making of protein hydrolyzate of snakehead fish head by using spray drying method and it is encapsulated with maltodextrin in which a final product in the form of starch is expected to ease the process of storage and extend the shelf-life of the product. This research was aimed to determine the quality of protein hydrolyzate starch of snakehead fish head with inlet temperature treatment of spray drying 120^{0}C and outlet temperature of 80^{0}C and the addition of maltodextrin. The design used is independent t-test. It was conducted to compare the average value of sample composition. Experimental data were processed using Statistical Package for Social Science (SPSS) 21.0 for Windows. The best treatment from the research is a comparison of snakehead fish starch and maltodextrin 95%:5%. The characteristic of physicochemical of snakehead fish starch as produced in the form of white starch with a yield of 21.35%, white degree L 97.73, water content 4.52%, ash 7.92%, protein 75.25%, fat 0.60%. Based on this, the protein hydrolyzate of snakehead fish head has the potential to be applied as a flavoring or flavor enhancer and it can be developed as a source of essential amino acids in food products because they contain almost complete essential amino acids.

Keywords : Amino Acids, Snakehead Fish Head, Maltodextrin, Spray Drying

I. INTRODUCTION

Generally, fish protein hydrolyzate is liquid with a short shelf-life so it must be stored in cold conditions. Storage at low temperatures is a method that has been commonly used to extend the shelf-life of food products that contain high water content (Belitz *et al.* 2009).Therefore, the second stage of the research is the making of protein hydrolyzate of snakehead fish head by using *spray drying* method and encapsulated with maltodextrin as the final product in the form of starch is expected to ease the process of storage and extend the shelf-life of the product. Berk (2009) explains the products produced by using *spray drying* method in the form of brightly-colored powder. Starch-food products contain low water content have several advantages including ease of transportation, storage and wider use. According to Cuq *et al.* (2011) that food is often made in the form of starch for a variety of reasons, including having a longer shelf-life, ease of transportation, and convenience for consumers. Starch-food products also do not require low temperatures to maintain quality so that it will reduce costs for equipment supply.

Previously, the study about protein hydrolyzate starch of fish has been conducted by Meiyani *et al*, 2014. By using shrimp head cooking water as a powdery flavor with the addition of 2.5% maltodextrin gave the highest glutamic acid by 36.85%. Suharso (2006) made flavor powder of tiger shrimp head (*Penaeus monodon*) enzymatically as an instant seasoning with 5% (w/v) maltodextrin filler. A research on protein hydrolyzate starch has been reviewed by Salamah *et al*, 2012 using catfish (*Clariasgariepinus*) as raw material and the supernatant was dried using a spray dryer with an inlet temperature of 120^{0}C and an outlet temperature of 80^{0}C. Djaafar *et al*, 2017 clarifying good quality pollen can be produced through the process of *spray drying* at an inlet temperature of 80^{0}C. Liu. *et al*, 2015 with CN 104719993 A as a patent invention, the invention of the processing of liquid squid hydrolyzate by an enzymatic method that is added ginger, garlic, and it is concentrated by spray drying for a delicious flavored food seasoning.

It is expected that the study of protein hydrolyzate starch of snakehead fish head by using spray drying method and encapsulation with maltodextrin can ease the process of storage and extend the shelf-life.

II. METHODS AND MATERIALS

A. Research Site

The research was conducted from 2018 to 2019, the making of protein hydrolyzate of snakehead fish head is conducted at the Laboratory of Biochemical and Miniplant, Agroindustrial Program, Department of Fisheries Product Processing Technology of Pangkep State Polytechnic of Agricultural; and for the processing of protein hydrolyzates starch of snakehead fish head by using spray-dryer method was conducted at the Agricultural Central Plant of Plantation Products of Makassar.

B. Materials and Tools

The materials used are snakehead fish head weighing 3 fish per kg obtained from Tempe Lake, Wajo district, South Sulawesi, and bromelin enzymes obtained at Delta Malang laboratory as manufactured by Xian Lyphar Biotech Activity of Enzyme 400.000 u/g min, maltodextrin, aquades obtained at Intrako Store of Makassar and analysis material.

The tools used in the processing procedure are analytical scales (Sartorius TE 64), ovens (Memmert), shellab vacuum ovens, Kjeldahl apparatus desiccators, waterbath shakers (Wise bath shakers WSB-18), centrifuges (HIMAC CR 21G), and chomameters (Monolta Camera CR-300), filter paper Wadmant 41, cool boxes, knives, electric meat grinders/blenders, fermentation jars, basins, and bottle packaging and caps and tools for chemical analysis uses analytical scales Mettler AE 100, erlenmeyer, funnel, pH meter (Thermo scientific-USA), Kjeldhal flask, reaction tube, condenser, oven, distillation flask, exicator, porcelain cup burette, digital scale.

C. Sample Preparation

Procedure for making protein hydrolyzate of snakehead fish head (Modified by Nurhayati *et al*. 2007) as follows: snakehead fish is weeded by removing the gills, and washed. After weeding, the head of snakehead fish is separated to be used as raw material for hydrolyzate.

D. Method

Protein hydrolyzates of snakehead fish head as obtained from the first stage of the research will be made into protein hydrolyzates of snakehead fish head in the form of starch which are expected to last longer during the storage process. In the second stage of the research, we conduct a comparison of the ratio of snakehead fish head hydrolyzate and the addition of maltodextrin (Snakehead Fish Head HPI:

Maltodextrin) 100% was HPKIG:M_1 = 97.5:2.5 (b/b) and HPIM$_2$ = 95:5 (b/b). After adding maltodextrin filler, it is dried with a spray dryer with an inlet temperature of 120^{0}C and an outlet temperature of 80^{0}C. Characteristics of protein hydrolyzate starch of snakehead fish head in physicochemical analysis are water content, ash, protein, fat, and yield and brightness level.

Water Content with Oven Method (AOAC 2005)

Determination of water content is based on differences in material weight before and after drying. Initially, the empty cup was dried in oven for 30 minutes at a temperature of 105^{0}C and then cooled in an exicator for 15 minutes, then weighed 3 - 5 grams of protein hydrolyzate of snakehead fish head and put in a cup then dried in an oven 105^{0}C for 6 hours. The cup was cooled in an exicator for 30 minutes and then weighed. Water content is calculated by using a formula:

$$\text{Water Content (\%)} = \frac{B-C}{B-A} x100\%$$

Protein Content (AOAC, 2005)

Protein solution is taken 10 ml and dilute it to 100 ml with distilled water in a flask, then put into Kjeldahl flask 500 ml and 10 ml H_2SO_4 (93% - 98% free-N) add 5 grams of mixture H_2BO_3, Na_2SO_4-HgO for catalyst. Rub thoroughly and continue for 30 minutes. After cooling, wash it in Kjeldahl flask with distilled water then boil again for 30 minutes.

After cooling, adding 140 ml of distilled water, and 35 ml of NaOH-$Na_2S_2O_3$ and a few grains of zinc. Then distilled, 100 ml of distillate was stored in Erlenmeyer containing 25 ml of saturated solution of boric acid and a few drops of PP indicator. The solution is obtained with 0.02 NHCl.

Ash Content with Gravimetric Method (AOAC, 2005)

As many as 3-5 gr samples is weighed and put in a cup, then burned until there is no smoke. After being put into the furnace, it is burned to gray. Ash is done in two stages, first at 400^{0}C and second at 550^{0}C. After the weight of cup is constant, the cup is then cooled in a desiccator and weighed. The ash content is determined by using a formula:

$$\text{Ash Content (\%)} = \frac{A}{B} x100\%$$

Fat Content (AOAC, 2005)

A sample of 2 grams is put in filter paper and in the sleeve. The fat flask that has been weighed then connected with the fat sleeve. Samples and fat solvents (*diethyl ether*) are put into fat sleeve. The series of fat flask and sleeves are mounted on the Soxhlet extractor which is connected to a recirculation chiller 4^{0}C. Fat samples were extracted at 60^{0}C for 7 - 8 hours. The mixture of fat and solvents contained in fat flask is distilled until drying. Fat flask is put in the oven at 105^{0}C for 2 hours. The flask is cooled in a desiccator until the weight is constant. Fat content is calculated by using a formula:

$$\text{Fat Content (\%)} = \frac{W3-W1}{W2} x100\%$$

Color (Hutching JB. 1999)

Color measurement was made using a colorimeter. The color reading included lightness (L), redness (a) and yellowness (b). The equipment was standardized with a white color standard.

E. Data Analysis

The design used is independent t-test. It was conducted to compare the average value of sample composition. Experimental data were processed by using *Statistical Package for Social Science* (SPSS) software 21.0 for Windows (Steel & Torrie 1993).

III. RESULTS AND DISCUSSION

The second stage of the research as the best results from the research of hydrolyzate products of snakehead fish head and it will make into protein hydrolyzate starch with the addition of maltodextrin as a coating material using a drying method using a spray dryer with an inlet temperature of 120^{0}C and an outlet temperature of 80^{0}C. According to Cuq *et al*. (2011), that food is often made in the form of starch for a variety of reasons, including having a longer shelf-life, ease of transportation, and convenience for consumers. Starch-food products also do not require low temperatures to maintain quality so that it will reduce costs for equipment supply. The physicochemical characteristics of the effect of the percentage of protein hydrolyzate of snakehead fish head and Maltodextrin on protein hydrolyzate starch products of snakehead fish head can be seen in Table 1.

Table 1. Effect of percentage treatment of protein hydrolyzate of snakehead fish head and Maltodextrin of protein hydrolyzate starch product of snakehead fish head

Composition (%)	HPI Snakehead Fish Head 97.5 %: Maltodextrin 2.5%	HPI Snakehead Fish Head 95 %: Maltodextrin 5 %
Yield	19.19 ± 0.04	21.35 ± 0.24
Brightness	86.0 ± 0.00	97.73 ± 0.12
Water	5.23 ± 0.20	4.52 ± 0.13
Ash	7.42 ± 0.04	7.92 ± 0.24
Protein	55.56 ± 0.09	70.25 ± 2.26
Fat	0.86 ± 0.07	0.60 ± 0.07

Source: Primary data processed, 2019

A.Content Level of Cork Head Hydrolsat Flour Yield

Yield content is one of the important parameters in the processing of fishery products which aims to estimate the number of parts of raw materials that can be utilized. According to Anwar and Rosmawati (2013), the percentage of the amount of hydrolyzate product produced to the volume of raw material before hydrolysis is called the yield of hydrolyzate product. Yield value can describe the economic value of a material. The higher of yield value, the higher of economic value because the higher of amount that can be utilized from the material.

Based on Table 1, yield value of protein hydrolyzate starch of snakehead fish head showed protein hydrolyzate of snakehead fish head 95%: maltodextrin 5% had a higher yield of 21.35% compared to protein hydrolyzate of snakehead fish head 97.5%: maltodextrin 2.5% had a yield of 19.10% . The study of protein hydrolyzate of snakehead fish head by using liquid protein

hydrolyzate treatment of snakehead fish head using maltodextrin by spray dryer method with an inlet temperature of 120^{0}C and an outlet temperature of 80^{0}C seen that the yield obtained was very low, this was caused by liquid hydrolyzate of snakehead fish head with high water content and adding maltodextrin will produce yield according to the amount of maltodextrine used and the working power of spray dryer which still separates the product attaches to the tube. The yield content of protein hydrolyzate starch of snakehead fish head can be seen in Figure 1.

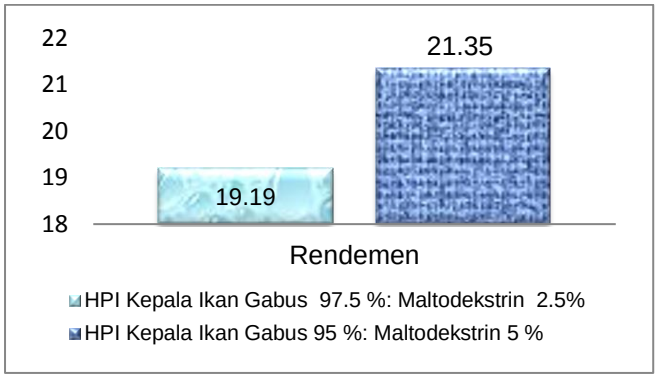

Figure 1. Yield content of protein hydrolyzate starch of snakehead fish head

Based on the results of significance analysis of independent t-test on the yield content of protein hydrolyzate starch of snakehead fish head with the comparison of protein hydrolyzate of snakehead fish head with maltodextrin were difference significantly ($p < 0.05$).Widadi (2011) showed that the yield value of protein hydrolyzate of catfish was 21.16%, it shows a small yield. According to Cucikodana, *et al.* (2012), the low yield is thought to be due to the effect of drying, where drying is the process of removing or disposing liquid material from a material that includes drying, roasting, evaporation, and others. The end result of drying is material that is free of water (liquid) or contains low amounts of water.

B. **Degree of White Cork Head Fish Flour Hydrolsat**

Table 1 protein hydrolyzate starch of snakehead fish head by using a comparison treatment of protein hydrolyzate of snakehead fish head and maltodextrine 97.5%:2.5%, a value of L 86.0 while hydrolyzate of snakehead fish head and maltodextrine 95%:5%, a value of L 97.73. The white degree of protein hydrolyzate starch of snakehead fish head can be seen in Figure 2.

White degree indicates the degree of color or brightness of a material, a scale from 0 to 100; the greater of L-value, the brighter of sample color. The results of observations of L (*lightness*), *a* (*redness*), and *b* (*yellowness*) and white degrees were conducted
by using Chromameter.

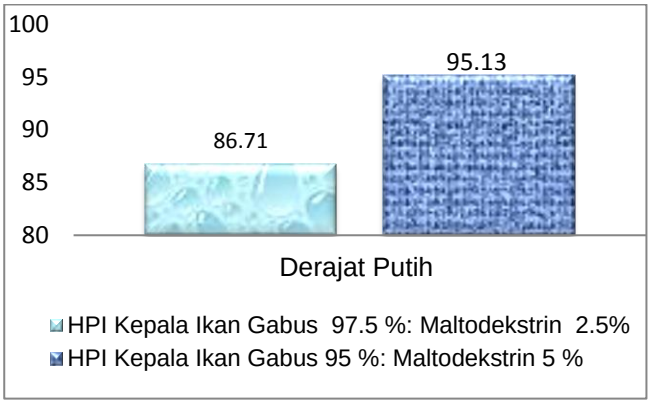

Figure 2. White degree of protein hydrolyzate starch of snakehead fish head

The results of *independent t-test* on the white degree of protein hydrolyzate starch of snakehead fish head with a comparison of protein hydrolyzate of snakehead fish head with maltofrtrin shows a significant difference ($p < 0.05$). White degree of protein hydrolyzate starch of snakehead fish head as obtained has index value (> 50) it indicate a bright color. Pilar and Reyes (2007) explain that the value of yellowness is usually caused by lipids, while

redness is influenced by protein precipitation. Denaturation or oxidation can also cause high brownish-yellow values in the product. According to Riansyah, *et al*. (2013), the ability of material to release water from its surface will be greater with increasing air temperature of drier used and the longer of drying process so that the resulting water content is lower. Salamah *et al*. (2011) states that water content resulting from the drying process by spray drying method is influenced by the temperature of the inlet and outlet, if the temperature used is too high then the risk of protein damage due to heat will also be even greater. The products produced from the spray drying method are brightly colored and porous (Berk 2009).

C. Proximate Analysis Results of Gabaus Fish Head Hydrolyzate Flour

Table 1 water content of protein hydrolyzate starch of snakehead fish head as dried with a spray dryer and uses inlet and outlet temperatures 120^{0}C and 80^{0}C, respectively shows the best treatment, namely the ratio of protein hydrolyzate of snakehead fish head and maltodextrine 95%:5% has a lower water content i.e 4.52% compared to protein hydrolyzate of snakehead fish head and maltodextrine 97.5%: 2.5% has a moisture content of 5.23%. The results of proximate analysis of the water content of the treatment ratio between protein hydrolyzate of snakehead fish head and maltodextrin as shown in Figure 4 that low water hydrolyzate protein content can be attributed to the high temperature used during the spray drying evaporation process. According to Sanapi (2013), the water content resulting from the drying process by the spray drying method is influenced by the inlet and outlet temperatures. A study of protein hydrolyzate starch of snakehead fish head as obtained from the two treatment comparisons between protein hydrolyzate of snakehead fish head and maltodextrin with spray drying method, obtained lower water content from research conducted by Widadi (2011) and Cholifah (2014) that showed that the value of water content of protein hydrolyzate of catfish was 5.46% by using spray drying method.

According to Sanapi (2013) states that water content resulting from the drying process by using spray drying method is influenced by the inlet and outlet temperatures. A research by Roslan, *et al*. (2014) showed that the value of water content of protein hydrolyzate of tilapia was 6.48% with the addition of 2.5% alkalase enzyme concentration. The results of *independent t-test* on the water content of protein hydrolyzate starch of snakehead fish head with a comparison of protein hydrolyzate of snakehead fish head with maltodextrnie were differences significantly ($p < 0.05$).

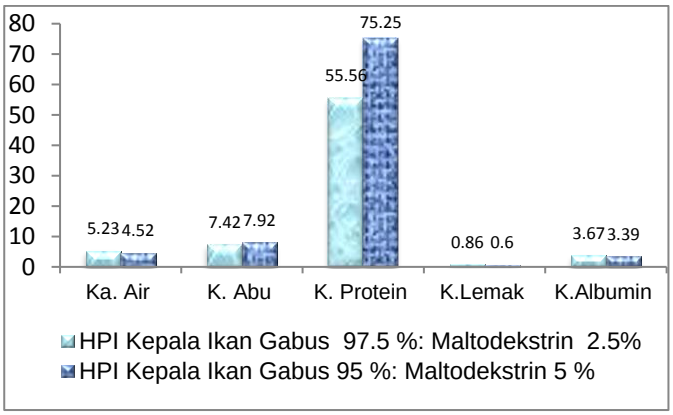

Figure 3. Proximate analysis result for comparison treatment of protein hydrolyzate of snakehead fish head and maltodextrin to protein hydrolyzate starch of snakehead fish head

Most foodstuff consists of 96% organic matter and water, the rest is mineral elements. The burning process of food to a temperature of 600^{0}C will cause organic matter to burn, but the inorganic material does not burn, namely in the form of ash consisting

of various mineral elements such as Ca, Mg, Na, P, K, Fe, Mn and Cu. Ash content indicates mineral content in foodstuffs (Winarno, 2008). Table 1 the ash content of protein hydrolyzate starch of snakehead fish head dried with spray dryer and inlet and outlet temperature 120^{0}C and 80^{0}C, respectively where the comparison of protein hydrolyzate of snakehead fish head and maltodextrine 97.5:2.5 had higher ash content was 7.42% and protein hydrolyzate of snakehead fish head and maltodextrine 95:5 has an ash content of 7.92%. Some researchers reported that the ash content of protein hydrolyzate of sardinella *by-product* had ash content ranging from 12.10 to 25.23% (Souissi *et al*. 2007). The results of proximate analysis of ash content for comparison treatment between the protein hydrolyzate of snakehead fish head and maltodextrin to protein hydrolyzate starch of snakehead fish head can be seen in Figure 3. The result of independence t-test analysis on the ash content of protein hydrolyzate of snakehead fish head with the comparison of protein hydrolyzate of snakehead fish head and maltofrtrin have significant differences ($p < 0.05$).

Protein is an essential molecule in the preparation of structure and functional processes of the living things. Proteins consist of amino acid chains that are connected by peptide bonds to form a variety of complex structures (Vaclavik and Christian, 2008). Table 1 the highest protein levels of protein hydrolyzate starch of snakehead fish head is a comparison of protein hydrolyzate of snakehead fish head and maltodextrine 95%:5% has 75.25% compared to protein hydrolyzate of snakehead fish head and maltodextrine 97.5%:2.5% has 50.56%, the high or low protein value can be influenced by the amount of water content lost (dehydration) from the material. The protein value as measured will be even greater if the amount of water lost is greater. The results of proximate analysis of protein content for comparison treatment between protein hydrolyzate of snakehead fish head and maltodextrin to protein hydrolyzate starch of snakehead fish head can be seen in Figure 3. Studies conducted by several researchers reported that protein content of protein hydrolyzate of catfish 35.6% (Amiza *et al*. 2013) is lower than the study of protein hydrolyzate for snakehead fish head. Protein hydrolyzate of snakehead fish head and maltodextrine 95%:5% with protein content 75.25% almost close to commercial fish protein hydrolyzate value that is 73-75% (International Quality Ingredients, 2011) and according to the Food and Agricultural Organization (2011) that protein hydrolyzate of snakehead fish head has a protein content of less than 80% included in type B protein content that meets the requirements as type B hydrolyzate. Nurhayati *et.al* (2007) states that protein content as measured in protein hydrolyzate of fish as a dissolved protein molecule. According to Bahalwan (2011), the increase in protein content is caused by the decrease in water content in the sample. Reducing the water content of foodstuff will increase compounds such as protein and minerals, but vitamins and dyes in general will be reduced. The result of independent t-test for protein content of protein hydrolyzate starch of snakehead fish head with a comparison of protein hydrolyzate of snakehead fish head with maltodextrin shows significant difference ($p < 0.05$).

Fat molecules consist of fatty acids and glycerol. Fats are contained in each type of foodstuff, but at different levels. Fat is also deposited in the tissues of several types of animals and organs of several types of plants. Fats are included in a group of compounds called *lipids*, and generally have insoluble properties in water (Belitz *et al*. 2009). Based on Table 1 it can be seen that the highest fat content of protein hydrolyzate of snakehead fish head is the comparison

of protein hydrolyzate and maltodextrin 95 %:5% is 0.60% compared to protein hydrolyzate of snakehead fish head and maltodextrin 97.5%:2.5% is 0.86%. The results of proximate analysis of fat content for comparison treatment between protein hydrolyzate of snakehead fish head and maltodextrin to protein hydrolyzate starch of snakehead fish head can be seen in Figure 4. Studies of protein hydrolyzate starch of snakehead fish head meet the standards of commercial fish protein hydrolyzate (Sanapi, 2013), namely less than 19-22%. This is due to the working process of bromelin enzyme which separates fat after being hydrolyzed. According to Nurhayati, *et al*. (2014), shows that fat content in hydrolyzate products is influenced by the characteristics of hydrolysis material used and the process of fat separation after hydrolysis. The process of separating fat after hydrolysis is done by filtering method using filter paper. According to Purbasari (2008), a decrease in fat content in fish protein hydrolyzate products is caused by the enzymatic hydrolysis process which changes the structure of fish tissue very quickly, where myofibril protein is greatly reduced during hydrolysis process, whereas the muscular cell membrane system looks relatively resistant to damage. During the hydrolysis process, these membranes tend to gather and form insoluble bubbles, resulting in loss of lipid membrane. Fat content of protein hydrolyzate starch of snakehead fish head is lower than fat content of commercial protein hydrolyzate namely 19-22% (International Quality Ingredients, 2011). The treatment of protein hydrolyzate of snakehead fish head and 95%:5% is 0.60% meets the requirements for type A hydrolysates because it has a fat content of less than 0.75% (FAO, 2011). Nilsang *et al*. (2005) states that protein hydrolyzate products which have low fat content are more stable against fat oxidation reactions during storage compared to fish protein hydrolyzate with high fat content. Fat molecules consist of fatty acids and glycerol. The results of independent t-test analysis on the fat content of protein hydrolyzate starch of snakehead fish head with a comparison of protein hydrolyzate with maltofrtrin were difference significantly ($p < 0.05$).

Conclusion

The best treatment from the research is a comparison of snakehead fish starch and maltodextrin 95%:5%. The characteristic of physicochemical of snakehead fish starch as produced in the form of white starch with a yield of 21.35%, white degree L 97.73, water content 4.52%, ash 7.92%, protein 75.25%, fat 0.60%. Based on this, the protein hydrolyzate of snakehead fish head has the potential to be applied as a flavoring or flavor enhancer and it can be developed as a source of essential amino acids in food products because they contain almost complete essential amino acids.

IV. REFERENCES

[1]. Amiza MA, Ow YW, Faazaz AL. 2013. Physicochemical properties of silvercatfi sh (*Pangasius* sp.) frame hydrolysate. *International Food Research Journal* 20(3): 1255-1262.

[2]. Anwar, L. O. dan Rosmawati. 2013. Characteristics of Tambelo (Bactronophorus sp.) Hydrolyzed Protein Hydrolyzed Using Papain Enzyme. Biogenesis1(2): 133-140.

[3]. Association of Official Analytical Chemist. 2005. *Official Method of Analysis of The Association of Official Analytical of Chemist*. Arlington, Virginia. USA: Association of Official Analytical Chemist, Inc.

[4]. Bahalwan, F. 2011. Effect of Salt Content and Storage Duration on Quality of Mounted Microbiology as Material of Learning Modules for the Formed Craftsman Society. [Bimafika,

2011, 3, 2992-297]. University Darussalam Ambon, Ambon.

[5]. Belitz HD, Grosch W, Schieberle P. 2009. *Food Chemistry*. Germany: Springer-Verlag.

[6]. Berk Z. 2009. *Food Proces Engineering and Technology*. New York:Academic Pr.

[7]. Cucikodana, Y, A. Supriadi, dan B. Purwanto. 2012. Effect of Boiling Temperature Differences and NaOH Concentration on Quality of Cork Fish Bone Powder (Channastriata). Fishtech, 1 (1): 91-101.

[8]. Cuq, B., E. Rondet, J. Abecassis. 2011. Food Powders Engineering, Between Knowhow and Science: Constraints, Stakes and Opportunities, *Powder Technology*, 208 : 244–251

[9]. Cholifah. 2014. Production and Characterization of White Snapper Viscera (Lates calcarifer). [Thesis]. Department of Aquatic Product Technology, Faculty of Fisheries and Marine Sciences, Bogor Agricultural University, Bogor

[10]. Djaafar T. F., Umar .S dan Anggara .A.2017 Effect of Maltodextrin Addition and Spray Dryer Inlet Temperature on the Physical-Chemical Characteristics of Pollen Pollen (*Canavalia virosa*) AGRITECH, Vol. 37, No. 3, Agustus 2017, Hal. 334-342 DOI: http://doi .org/10.22146/ agritech. 10446 ISSN 0216-0455 (Print), ISSN 2527-3825 (Online) Tersedia online di https://jurnal. ugm.ac.id/agritech

[11]. Food and Agricultural Organization. 2011. Fish Protein Concentrate. http://www. fao.org/. [14 November 2016].

[12]. Meiyani ,D. N.A.T. , Putut H. R dan Apri D. 2014. Utilization of White Shrimp Head Decoction (Penaeus merguiensis) as Flavor in Powder Form with the addition of Maltodextrin. Journal of Processing and Biotechnology of Fisheries Products Volume 3, Number 2, Tahun 2014, Halaman 67-74 *Online di : http:// www ejournal -s1.undip .a c.id/index.php/j pbhp*

[13]. Suharso (2006), Suharso, T. 2006. Enzymatic Making of Flavored Prawn Head Powder (Penaeus monodon) as an Instant Seasoning for Cuisine. [Thesis]. The Institute of Agriculture Bogor. Bogor

[14]. Salamah dkk, 2012 Salamah, E., Nurhayati,T., Widadi, I. R. 2012. Manufacture and bacterial hydrolysis of protein from catfish (Clariasgariepinus) using the papain enzyme. JPHPI, Volume 15 Number 1

[15]. Steel RGD, Torrie JH. 1993. Statistics Principles and Procedures, A Biometric Approach. 2nd ed. Jakarta: Gramedia Main Library

[16]. Salamah, E., Nurhayati, T., Widadi, I. R. 2012. Preparation and Aracterization of Protein Hydrolyzate from Dumbo Catfish (Clariasgariepinus) Using the Papain Enzyme. JPHPI, Volume 15 Number 1.

[17]. Salamah E, Nurhayati T, Widadi IR. 2011. Making and characterizing protein hydrolyzate from African catfish (Clarias gariepinus) using the enzyme papain. Indonesian Fisheries Product Processing Journal 15 (1): 9-16

[18]. Sanapi, C. H. 2013. Characteristics of Functional Hydrolyzate Protein Catfish (Clarias gariepinus). [Thesis]. Department of Aquatic Product Technology, Faculty of Fisheries and Marine Sciences, Bogor Agricultural University, Bogor.

[19]. Souissi N, Bougatef A, Ellouz YT, Nasri M. 2007. Biochemical and functional properties of Sardinella (*Sardinella aurita*) by product hydrolisates. *Food Technol Biotechnol* 45(2): 187-194.

[20]. Hutching JB. 1999. *Food Color and Appearance*.Chapman and Hall Food Science Book.Gaithersburg Maryland (USA): AspenPublishers Inc.

[21]. International Quality Ingredients. 2005. Product specification: fish protein hydrolysate. http://www.IQI.com [16 Juni

[22]. Liu,H., Chunyan,L., Lu,Y., Jiang , Chenxiao, E., Gaofeng,Y., and Xubo, F. 2015 . *Application Method of Hydrolysate after Squid Tentacles Peeled through Enzymic Method and Seafood-Flavor Seasoning Prepared through Method*. Paten CN104719993.

[23]. Nurhayati et al. (2007) Nurhayati T, Salamah E, Hidayat T. 2007. Characteristics of the protein hydrolyzed cellar (Caranx leptolepis) which are enzymatically processed.Bul Aquatic Product Technology 10 (1): 23-34

[24]. Nurhayati, et al. (2014, E. Salamah, Cholifah, and R. Nugraha. 2014. Optimization of the Process of Hydrolysis of White Snapper Offal. JPHPI, 17 (1): 42-52.

[25]. Nilsang S, Lertsiri S, Suphantharika M, Assavanig A. 2005. Optimization of enzymatic hydrolysis of fish soluble concentrate by commercial proteses.*J Food Engineering* 70: 571-578.

[26]. Pilar T, Reyes P. 2007. Simultaneous application of transglutaminase and high pressure to improve functional properties of chicken meat gels. *Food Chem*. 100(1):264–272.

[27]. Purbasari, D. 2008. Production and Characterization of Protein Hydrolyzate From Ngur Mas Shells (Atactodea striata). [Thesis]. Fisheries Product Technology Study Program, Faculty of Fisheries and Marine Sciences, Bogor Institute of Agriculture, Bogor.

[28]. Riansyah, A, A. Supriadi, and R. Nopianti. 2013. The Effect of Temperature and Drying Time Differences on the Characteristics of Trichogast erpectoralis Salted Fish Using Oven. Fishtech, 2 (1): 53-68.

[29]. Roslan, J.K.F. M. Yunos, N. Abdullah, S. Mazlina, dan M.Kamal. 2014. Characterization of Fish Protein Hydrolysate From Tilapia (Oreochromis niloticus) By-Product. Agriculture and Agricultural Procedia, 2: 312-319.

[30]. Vaclavik VA, Christian EW. 2008. *Essential of Food Science*. Ed ke-3. New York: Springer

[31]. Widadi, I.R. 2011. Preparation and Characterization of Protein Hydrolyzate from Dumbo Catfish (Clarias gariepinus) Using Papain Enzyme [Thesis]. IPB's Faculty of Fisheries and Marine Sciences.

[32]. Winarno FG. 2008. Food Chemistry and Nutrition. Bogor: M-Brio Press.

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Sublingual Tablets : An Overview

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ABSTRACT

Drug delivery via the oral mucous membrane is considered to be a promising alternative to the oral route. Sublingual route is a rapid onset of action and better patient compliance than orally ingested tablets. Sublingual literally meaning is "under the tongue", administrating substance via mouth in such a way that the substance is rapidly absorbed via blood vessels under tongue. Peroral administration of drug has disadvantages such as Hepatic first pass metabolism and enzymatic degradation within the GI tract that limits oral administration of certain classes of drug like peptides and proteins. So, other absorptive mucosa is considered as potential sites for drug administration. Trans-mucosal routes of drug delivery (i.e. the mucosal linings of the nasal, rectal, vaginal, ocular, and oral cavity) offer several advantages over peroral administration for systemic delivery. This review highlights the sublingual dosage forms for the treatment of migraine, advantages, Disadvantages, various evaluation parameters and commercially available sublingual dosage forms.

Keywords : Sublingual Tablets, Mucosa, Pregastric absorption, Drug Delivery, Oral Mucous Membrane

I. INTRODUCTION

Drug delivery through the sublingual route had emerged from the desire to provide immediate onset of pharmacological effect. Dysphasia (difficulty in swallowing) is a common problem of all age groups, especially geriatrics, pediatric, and patients who are mentally retarded, uncooperative, nauseated or on reduced liquid intake/diets have difficulties in swallowing these dosage forms[1,2]Sublingual means under the tongue. Sublingual drug delivery (SL) of the medication implies arrangement of the medication under the tongue and drug comes to straightforwardly into the circulation system through the ventral surface of the tongue and floor of the mouth. The decreasing order of permeability in the buccal cavity is the sublingual, the buccal area (cheek), then the palatal area. The order is generally based upon the relative thickness and the extent of blood supply to the specific part [3].

This course has a few particular points of interest over the enteral and parenteral courses of medication conveyance because of its rich blood supply, quick onset of activity, improved bioavailability, shirking of the principal pass and sustenance impacts, expanded patient consistence, and simplicity of self-solution. Throughout the years, various items exploiting oral mucosal medication conveyance have been presented in the business sector [4-8].

II. METHODS AND MATERIAL

Sublingual drug delivery[9]

Sublingual means under the tongue and refer to the pharmacological route of administration by which

drugs diffuse into the blood through tissues under the tongue.[10] Sublingual route offers direct contact of drug with oral mucosa which will leads to come directly in to systemic circulation which leads to enhance bioavaibility of dosage foam. Dysphagia (difficulty in swallowing) which is a common problem of all age groups, children, elderly, uncooperative or on reduced liquid intake have difficulties in swallowing sublingual route is promising approach for overcoming this type of problems after the oral administration of drug the drug goes to hepatic first pass metabolism this will result in to decrease bioavaibility of drug formulation. Sublingual route of drug delivery is promising approach to remove this type of problems [11].

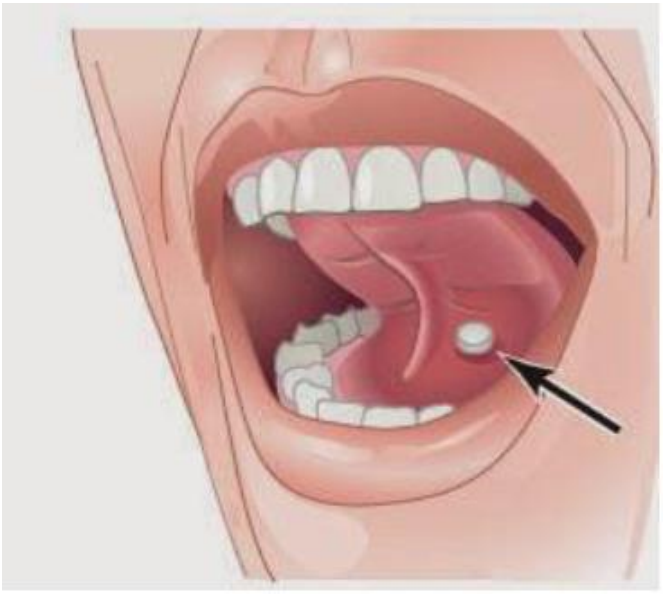

Figure 1: Sublingual drug delivery.[12]

Mechanism of sublingual administration

The absorption potential of the buccal mucosa is influenced by the lipid solubility and therefore the permeability of the solution (osmosis), the ionization (pH), and the molecular weight of the substances. For example, absorption of some drugs via the buccal mucosa is shown to increase when carrier pH is lowering (more acidic) and decrease with a lowering of pH (more alkaline) [13,14].The cells of the oral epithelium and epidermis are also capable of absorbing by endocytosis (the uptake of particles by a cell as if by hollowly wrapping itself around it. These engulfed particles are usually too large to diffuse through its wall). It is unlikely that this mechanism is used across the entire stratified epithelium. It is also unlikely that active transport processes operate within the oral mucosa. However, it is believed that acidic stimulation and uptake into the circulatory system[15].

Advantages[15,16]

- Ease of administration to patients who refuse to swallow a tablet, such as pediatric, geriatric patients and psychiatric patients.
- Convenience in administration of drug and accurate dosing as compared to liquid formulations.
- Water is not required for swallowing the dosage form, which is convenient feature for patients who are traveling and do not have immediate access to water.
- Good mouth feels property helps to change the basic view of medication as "bitter pill", particularly for pediatric patients.
- Fast dissolution of medicament and absorption which will leads to rapid, onset of action
- Some drugs are absorbed from the mouth pharynx and oesophagus as the saliva passes down into the stomach, in such cases bioavailability of drugs is increased.
- It provides advantages of liquid formulations in the form of solid dosage form.
- Pregastric absorption can result in improved bioavailability and as a result of reduced dosage, improved clinical performance through a reduction of unwanted effects. [15][16]

Disadvantages[17][18]

- Since sublingual administration of drugs interferes with eating, drinking, and talking, this route is generally considered unsuitable for prolonged administration.
- Although this site is not well suited to sustained-delivery systems.
- Sublingual medication cannot be used when a patient is uncooperative or unconscious.
- The patient should not smoke while taking sublingual medication, because smoking causes vasoconstriction of the blood vessels. This will decrease the absorption of the medication.

III. RESULTS AND DISCUSSION

SUBLINGUAL FORMULATIONS

Bioadhesive sublingual tablet[19]

The new sublingual tablet concept presented is based on interactive mixtures consisting of a water-soluble carrier covered with fine drug particles and a Bioadhesive component. With this approach, it is possible to obtain rapid dissolution in combination with Bioadhesive retention of the drug in the oral cavity.

Fast-disintegrating sublingual tablets[20]

The Tablets that disintegrate or dissolve rapidly in the patient's mouth are convenient for young children, the elderly and patients with swallowing difficulties, and in situations where potable liquids are not available. Only the small volume of saliva is usually sufficient to result in tablet disintegration in the oral cavity. Medication can then be absorbed partially or entirely into the systemic circulation from blood vessels in the sublingual mucosa.

Thin film drug delivery [21]

Delivering drugs to the systemic circulation via a thin film that dissolves when in contact with liquid referred to as a dissolving film or strip. Thin film are made using different grade of biopolymers. The advantage of this type of formulation is it have potential to improve the onset of action in lower dose.

Lipid matrix sublingual tablet[22]

Lipid Matrix Sublingual Tablet is formulation which uses advances in sublingual and liposomal technology to formulate a dosage form that offers a faster and more complete absorption than traditional oral routes of administration. The Lipid Matrix Sublingual Tablet is a bioavailable, quick, convenient, and consistent dosage form for many specialty neutraceuticals that are often taken orally. Examples: Glutathione MB12 (Methylcobalamin).

EVALUATION PARAMETERS [23-26]

Evaluation parameters of tablets mentioned in the Pharmacopoeias need to be assessed, along with some special tests. The quality of tablet, once formulated by rule, is generally dictated by the quality of physicochemical properties of blend.

Disintegration time (DT):

A relatively simple method with rigorous conditions was developing to evaluate the DT of sublingual tablets. Each individual tablet was dropped into 10-mL glass test tube (1.5-cm diameter) containing 2 ml distilled water, and the time required for complete tablet disintegration was observed visually and recorded using a stopwatch. The visual inspection was enhanced by gently rotating the test tube at a 45o angle, without agitation, to distribute any tablet

particles that might mask any remaining undisintegrated portion of the tablets. In the USP disintegration test for sublingual tablets, the disintegration apparatus for oral tablets is used without the covering plastic disks, 22 and 2 minutes is specified as the acceptable time limit for tablet disintegration.

Wetting time (WT):

Although a wetting test is not a USP standard test, it is useful for quality control and provides supportive evaluation of these sublingual tablets. Unlike the disintegration test, the wetting test uses minimal water, which may be more representative of the quantity of moisture available sublingually. Using this test, the time required for moisture to penetrate the tablet completely is measured and possibly represents the time required to release drug in the presence of minute volumes of saliva. The tablet was placed at the center of 2 layers of absorbent paper fitted into a rectangular plastic dish (11 cm × 7.5 cm). After the paper was thoroughly wetted with distilled water, excess water was completely drained out of the dish. The time required for the water to diffuse from the wetted absorbent paper throughout the entire tablet was then recorded using a stopwatch.

Bulk density:

Bulk density of was determined by taking a known mass of powder in a 50 ml graduated measuring cylinder which is attached to the bulk density apparatus. The bulk density was calculated by following eq.

Bulk density= weight of powder in gm/ bulk vol. of powder

Tapped density:

Tapped density was determined by tapping method using measuring cylinder containing weighed amount of powder. The cylinder was dropped 3 times from a height of 1 inch at an interval of 2 sec. tapped density was calculated by following eq.

Tapped density= mass of powder /vol. of powder after tapping

Angle of repose:

For the angle of repose of the material was poured through a funnel to form a cone. The tip of the funnel should be held closed to the growing cone and slowely raised as the pile grows, to minimize the impact of falling particles. Stop pouring the material when the pile reached a predetermined height or the base a pradetermined width. Rather than attempt to measure the angle of the resulting cone directely, devided the height by half the width of the base of the cone. The inverse tangent of this ratio is the angle of repose. Formula for angle of repose:

tanθ = h/ r

h = height of pile, r = radius of pile

Carrs compressibility index:

This is an important property in maintaining uniform weight. It is calculated by using following formula

$$\%\text{compressibility index} = \frac{\text{Tapped density} - \text{Bulk density} * 100}{\text{Tapped density}}$$

Hausner's ratio:

A similar index to indicate the flow properties can be defined by Hausner's ratio. Hausner's ratio can be calculated by using following formula:

Hausner's ratio = (Tapped density x 100) / (bulk density)

Weight variation:

20 tablets were selected at random, individually weighed and the average weight was calculated. None of the tablets deviated from the average weight by more than ±7.5%.

Hardness test:

Tablets require a certain amount of strength or hardness and resistance to friability to with stand mechanical shocks. The hardness of tablet was measured by Monsanto hardness tester. The hardness of sublingual tablet is important factor, because if the sublingual tablet is too hard, the solvent borne drug attenuation may not be absorbed into an interior portion of the tablet and therefore remains on a surface portion of the tablet, where the drug attenuation may not adhere to the sublingual tablet. If the sublingual tablet is too soft, the sublingual tablet may be disintegrated by the solvent of the drug attenuation.

IV. CONCLUSION

Drug delivery through the sublingual route had emerged from the desire to provide immediate onset of pharmacological effect. Dysphasia (difficulty in swallowing) is a common problem of all age groups, especially geriatrics, pediatric, and patients who are mentally retarded, uncooperative, nauseated or on reduced liquid intake/diets have difficulties in swallowing these dosage forms. So, other absorptive mucosa is considered as potential sites for drug administration. Trans-mucosal routes of drug delivery (i.e. the mucosal linings of the nasal, rectal, vaginal, ocular, and oral cavity) offer several advantages over peroral administration for systemic delivery. This review highlights the sublingual dosage forms of advantages, Disadvantages, various evaluation parameters and commercially available sublingual dosage forms.

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VI. REFERENCES

[1]. Ishikawa T, Koizumi N, Mukai B. Pharmacokinetics of acetaminophen from rapidly disintegrating compressed tablet prepared using microcrystalline cellulose (PH-M-06) and spherical sugar granules. Chem Pharm Bull (Tokyo) 2001; 49: 230-32.

[2]. Price TM, Blauer KL, Hansen M, Stanczyk F, Lobo R, Bates GW. Single-dose pharmacokinetics of sublingual versus oral administration of micronized 17 beta-estradiol. Obstet Gynecol 1997; 89: 340-45.

[3]. Kurosaki Y, Takatori T, Nishimura H, Nakayama T, Kimura T . Regional variation in oral mucosal drug absorption permeability and degree of keratinization in hamster oral cavity. Pharm Res 1991; 8: 1297-1301.

[4]. Mullen KD, Sanyal AJ, Bass NM, Poordad FF, Sheikh MY, et al. (2014) Rifaximin is safe and well tolerated for long-term maintenance of remission from overt hepatic encephalopathy. ClinGastroenterolHepatol 12: 1390-1397.

[5]. Ruiz J, Mensa L, O'Callaghan C, Pons MJ, González A, et al. (2007) In vitro antimicrobial activity of rifaximin against enteropathogens causing traveler's diarrhea. DiagnMicrInfec Dis 59: 473-475.

[6]. Jiang Z, Ke S, Dupont HL (2010) Rifaximin - induced alteration of virulence of diarrhoea producing Escherichia coli and Shigellasonnei. Int J Antimicrob Agents 35: 278-281.

[7]. Castro R, Domenichelli V, Lorenzo FPL, Prestipino M, Perrotta ML (1998) Rifaximin treatment for acute recurrent diarrhea in children with genitourinary disorders. CurrTherap Res 59: 746-752.

[8]. World Health Organization (2014) Antimicrobial Resistance: global report on surveillance, WHO Press: Geneva

[9]. Patel P, Makwana S, Jobanputra U, Ravat M, Ajmera A, "Sublingual route for the systemic delivery of Ondansetron." Int J Drug Devlopment Res, 2011; 3(4): 36–44.

[10]. Nibha KP, Pancholi SS, "An Overview on: Sublingual Route for Systemic Drug Delivery." Int J Res Pharm Biomed Sci, 2012; 3(2): 913–23.

[11]. Nandini, Sublingual Nitroglycerin Delivery for Treatment and Prevention of Angina Pectoris 2018 http://www.pharmainfo.net/nandini/blog/introduction-tablets.

[12]. A Dev, SS Mundke, Critical aspects in sublingual route of drug delivery, Pharmaceutical and Biological evaluation, 2016; 3(1): 1-4.

[13]. McElnay, JC; Al-Furaih, TA; Hughes, CM; Scott, MG; Elborn, JS and Nicholls, DP (1995), "The effect of pH on the buccal and sublingual absorption of captopril", Eur J Clin Pharmacol, 48(5), 373-379

[14]. Boer, D et al. (1984), "Drug absorption by sublingual and rectal routes", British J Anaesthesia, 56, 69-82.

[15]. Al-Ghananeem, AM; Malkawi, AH and Crooks, PA (2006), "Effect of pH on Sublingual Absorption of Oxycodone Hydrochloride", AAPS PharmSciTech, 7(1).

[16]. Rubinstein NH. 2000 Tablets In; Aulton‰, M.E(Ed), Pharmaceutics, the Science of Dosage Form Design Churchill Livingstone, Edinburgh London on Melbourne and New York, Page 305.

[17]. Bhati R, Nagrajan RK. A detailed review non oral mucosal drug delivery system. IJPSR 2012; Vol3 (1):659- 681.

[18]. Reddy LH. IJPS 2002;0975-1491.

[19]. A review on bioadhesive buccal drug delivery systems: current status of formulation and evaluation methods: Chinna Reddy P, Chaitanya K.S.C., Madhusudan Rao Y, DARU Journal of Pharmaceutical Sciences, 2011; 19(6): 385-405.

[20]. Singh M, Chitranshi N, Singh AP, Arora V, Siddiqi AW, "An Overview on fast Disintegrating Sublingual Tablets." Int J Drug Deliv, 2012; 4: 407–17.

[21]. Patel P, Makwana S, Jobanputra U, Ravat M, Ajmera A, "Sublingual route for the systemic delivery of Ondansetron." Int J Drug Devlopment Res, 2011; 3(4): 36–44.

[22]. USP/NF. Physical Tests: Disintegration (701) 22/17 ed. Rockville, MD: United States Pharmacopoeial Convention Inc; 1990.

[23]. USP/NF. Official Monographs: Nitroglycerin Tablets. 22/17 ed. Rockville, MD: United States Pharmacopoeial Convention Inc; 1990.

[24]. Bi Y, Sunada H, Yonezawa Y, Danjo K, Otsuka A, Iida K. Preparation and evaluation of a compressed tablet rapidly disintegrating in the oral cavity. Chem Pharm Bull (Tokyo) 1996; 44: 2121-2127.

[25]. Narendra C, Srinath MS, Rao PB. Formulation and evaluation of a sublingual tablet containing terbutaline sulphate: optimization and in vivo studies. Ars Pharmaceutica 2005; 46(2): 139-158.

[26]. Patel MV, Prajapati BG, Patel MM. Effect of hydrophilic polymers on buccoadhesive Eudragit patches of propranolol hydrochloride using factorial design. AAPS PharmSciTech 2007; 8: Article 45.

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Factors Affecting Immigrant Patients Against Utilization of Health Services at Tamalanrea Health Center

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ABSTRACT

Good health care is a community need and is often a measure of development success. The utilization of health service units is still relatively low, although the Puskesmas continue to try to bring health services closer to immigrants. This shows that the lack of confidence of immigrant patients in the health services provided by health workers so that immigrant patients prefer to be referred and continue treatment at the hospital. The purpose of this study is to analyze the factors that influence immigrant patients on the utilization of health services. This research was conducted at Tamalanrea Public Health Center in Makassar City from July-August 2019. The population in this study was 154 people based on data in Tamalanrea Health Center in the last 6 months while the sample in this study was 59 people. Analysis of the data used in this study includes univariate and bivariate analysis stages using multiple regression tests using SPSS version 10. The results of this study indicate that (1) Age has no influence on the utilization of health services, gender has an influence on the utilization of health services in Tamalanrea Health Center ; (2) There is an influence of facilities, and trust in the use of health services with the respective p-value: facilities p = 0.015 and trust p = 0.004. While knowledge has a value of p = 0.665 so that it does not influence the utilization of health services at the Tamalanrea Health Center. The important role of the immigration detection house agency is to help promote and convince immigrants or foreign refugees that first-rate health services can provide the best health services and cure their sickness.

Keywords : Health Utilization, Immigrant, Health Center, Knowledge, Facilities, Trust.

I. INTRODUCTION

Good health services are a community need and are often a measure of development success (Rumengan et al., 2015). Individual needs to utilize health services are directly affected by psychological variables which include: tastes, sick-health perceptions, expectations, assessments of providers; and individual characteristics including age, sex, level of education and type of work. Indirect factors are influenced by socio-economic and culture (Damayanti et al., 2017).

Utilization of health services is the use of service facilities provided either in the form of outpatient care, inpatient care, home visits by health workers or other forms of service utilization based on availability and continuity of services, community acceptance and fairness, easily reached by the community, affordable , and quality (Tasya and Andriany, 2016).

Utilization of health services at the health center level has several factors that influence it, namely consumer factors in the form of: education, livelihoods, knowledge and perceptions of patients; organizational factors such as: availability of resources, affordability of service locations, and social access; and service provider factors including: health worker behavior (Abdullah et al., 2017).

In the current era of globalization, ethical principles need to be maintained because without ethics and without being strengthened by the law, one human can be regarded as a rival by others. The field of health services must be based on ethical and legal principles as a result of the arising of human greed, which in turn creates conflict between patients with health workers and among other health workers (Indar, 2017).

Immigrants or refugees are refugees who cannot and will not likely return to their home countries due to fears of life-threatening situations in matters such as race, religion, citizenship, membership in social groups, or political matters (Collyer, 2010). But sometimes the problems are growing so that immigrants have no choice but to try to enter a country illegally. Also, related to the right to health and education, as well as residence support from related parties often do not meet the needs of refugees. For this reason, IOM's role as an international organization is very much needed to establish cooperation with destination countries of migrants while ensuring that the rights of these migrants can still be fulfilled well (Nst, 2018).

Immigrants have some special needs for certain types of health problems because of the prevalence of the disease and the healthy environment in the country of origin. For example, the rate of tuberculosis is much higher among immigrants than among native birth populations (for example, in 2010, 18.1% for foreign births vs 1.8% for US births, especially among foreigners born in Asia and the Islands. Pacific, 33.2 %, and blacks born abroad, 26.2%; Centers for Disease Control and Prevention Asthma rates are also higher among foreigners born than those born in the US (Hwang, 2016).

Tamalanrea Health Center is one of the health centers that cooperates with IOM in providing health services to immigrants who come for treatment. The immigrants referred to in this study are foreign refugees who came to Indonesia due to various conflicts in their country. Also, the Tamalanrea Health Center has a large enough working area in dealing with immigrant patients, consisting of 4 community houses or shelters and immigration detention centers. In the working area of Tamalanrea Health Center there are 4 Guesthouse points, namely in 155 A as many as 45 people, 155 B as many as 58 people, 155 C as many as 22 and 155 D as many as 77 people. So the total number in the working area of Tamalanrea Health Center is 202 people. The origin of immigrants in the Tamalanrea Health Center area comes from various countries, namely: Afghanistan, Somalia, Ethiopia, Iran, Myanmar, Sudan, and Pakistan. According to Anderson, 3 factors influence a person's behavior in utilizing health services, namely predisposing characteristics (education, employment, ethnicity), supporting characteristics (enabling), namely facilities, infrastructure and needs characteristics (Wahyuni, 2012).

Based on preliminary data obtained from Tamalanrea Health Center, the number of visits of immigrant patients in the last 6 months, namely: December 2018 as many as (20 people); January 2019 (33 people); February 2019 as many as (31 people); March 2019 (31 people); April 2019 as many as (20 people); May 2019 (11 people). From the above data it can be

concluded that the number of patient visits during the past 6 months fluctuated and in the last 2 (two) months dropped dramatically. In addition the number of immigrant patient referrals in the last 6 months from data obtained at the Tamalanrea Health Center are: December 2018 (15 people); January 2019 (16 people); February 2019 (19 people); March 2019 (12 people); April 2019 (19 people); May 2019 (8 people). From the above data, it can be concluded that half of the total number of patient visits that come for treatment has been given a referral to the hospital with the most dominant reason at the request of immigrant patients themselves (Puskesmas Tamalanrea, 2019). Meanwhile, based on the number of diseases that can be served at the Puskesmas 155 types of diseases can be handled/served by the Puskesmas. But in fact, the number of referrals for immigrant patients who are issued every month is increasing while the type of disease referred can be treated/served at the Tamalanrea Health Center.

The utilization of health service units is still relatively low, although the Puskesmas continue to try to bring health services closer to immigrants. This shows that the lack of immigrant patients' trust in the health services provided by health workers in the Tamalanrea Health Center so that immigrant patients prefer to be referred and continued treatment at the Hospital. From the description above, it appears that the utilization of health services in Puskesmas by immigrant patients is still lacking, although physically the health facilities in Puskesmas Tamalanrea can handle 155 types of diseases. This may occur because the available service facilities are not following the wishes of the immigrant community or the lack of confidence of immigrant patients in the services provided. The purpose of this study was to analyze the factors that influence immigrant patients on the utilization of health services in the Tamalanrea Health Center.

II. METHODS AND MATERIAL

This research was conducted in August 2019 at the Tamalanrea community health center, Makassar. Based on data at the Tamalanrea Health Center in the past 6 months, the population in this study was 154 people. The criteria for determining the sample were patients visiting community health centers more than once so as many as 59 people were obtained. The sampling technique in this study used purposive sampling. Data collection is done using observation, interviews, and documentation. Analysis of the data used in univariate and bivariate analysis using multiple regression tests with the program SPSS version 10.

III. RESULTS AND DISCUSSION

1. Univariate Analysis

Univariate analysis was performed to determine the frequency distribution of each study variable both the dependent variable and the independent variable. The results of the univariate analysis in this study are as follows.

a. **Age Group.** Is a group of values based on the age of the respondents with the interval used is 10 years which can be seen in Table 1.

Table 1. Distribution of Respondents by Age Group for Immigrant Patients at the Tamalanrea Health Center in 2019

Age (year)	(n)	%
15-25	20	33,9
26-36	26	44,1
37-47	11	18,6
48-58	2	3,4
Amount	**59**	**100,0**

Source: primary data that has been processed, 2019

Table 1 shows that of the 59 respondents based on the age of the respondents, the most were in the 26-36 years age group, which were 26 people (44.1%) and the least number of respondents in the 48-58 year age group, namely as many as 2 people (3, 4%). Based on the results of the study in table 1 shows that most age groups are in the age group 26-36 years as many as 26 people (44.1%). Age can affect someone in the utilization of health services. The older a person is, the more critical and understanding the importance of service utilization.

b. Gender. The distribution of respondents by sex can be seen in Table 2.

Table 2. Distribution of Respondents by Gender Immigrant Patients in the Tamalanrea Health Center in 2019

Gender	(n)	(%)
Man	54	91,5
Woman	5	8,5
Amount	**59**	**100,0**

Source: primary data that has been processed, 2019

Table 2 shows that of the 59 respondents based on the most sex, there were 54 male respondents (91.5%) while the least female respondents were 5 people (8.5%).

c. Latest Education. The last education is the last level of education obtained by respondents. The distribution of respondents based on their latest education can be seen in Table 3.

Table 3. Distribution of Respondents Based on the Latest Education of Immigrant Patients in Tamalanrea Health Center in 2019.

Last Education	(n)	(%)
Not Finished primary school	4	6,8
Primary school	7	11,9
Junior high school	17	28,8
Senior high school	26	44,1
College	5	8,5
Amount	**59**	**100,0**

Source: primary data that has been processed, 2019

Table 3 shows that of the 59 respondents based on their most recent education the most were high school / equivalent categories of 26 people (48.0%) and the smallest number of respondents were elementary school as many as 4 people (2.0%). Ha NTH et al (2012) in a study (Rushender et al., 2017) stated that health services in Vietnam found that education of household heads and the number of sick people in the family did not have a significant influence on the utilization of public health services (or) health services. Likewise in a study conducted by Rushender (2017) stated that the education factor of household heads did not show a significant relationship in PHC utilization to the distance traveled (Rushender et al., 2017).

d. Country of Origin. The distribution of respondents by country of origin can be seen in Table 4.

Table 4. Distribution of Respondents by Country of Origin of Immigrant Patients at the Tamalanrea Health Center in 2019.

Country of origin	(n)	(%)
Afghanistan	53	89,8
Euthopia	1	1,7
Myanmar	2	3,4
Sudan	3	5,1
Amount	**59**	**100,0**

Source: primary data that has been processed, 2019

Table 4 shows that of the 59 respondents by country of origin the most were from Afghanistan, namely as many as 53 people (89.8%) and the smallest number of respondents originating from Ethiopia, namely as many as 1 people (1.7%).

e. **Length of stay in Makassar.** The distribution of respondents based on length of stay in Makassar can be seen in Table 5

Table 5. Distribution of Respondents Based on Length of Stay of Immigrant Patients at Tamalanrea Health Center in 2019

Long stay in Makassar (Year)	(n)	(%)
1	4	6,8
2	10	16,9
3	5	8,5
4	7	11,9
5	17	28,8
6	11	18,6
7	5	8,5
Amount	59	100,0

Source: primary data that has been processed, 2019

Table 5 shows that of the 59 respondents based on length of stay the most were for 5 years as many as 17 respondents (28.8%) and the least number of respondents was for 1 year as many as 4 people (6.8%).

f. Frequency Distribution of Research Variables

In this study, there are five independent variables namely Knowledge, facilities, attitudes and behavior of health workers, trust and length of stay in Makassar, which will be seen as influencing the dependent variable, namely the utilization of health services. The frequency distribution of research variables can be seen in Table 6.

Table 6. Based on the results of the study, the frequency distribution for variable utilization of health services

Service utilization	(n)	(%)
To take advantage of	45	76,3
Haven't utilized	14	23,7
Amount	**59**	**100,0**

Source: primary data that has been processed, 2019

Based on Table 6 shows that of 59 respondents in Tamalanrea Health Center, 45 respondents (76.3) had utilized health services and 14 respondents (23.7%) had not utilized health services. Health service utilization was significantly higher among refugees, who also reported greater service needs than native immigrants (Elsouhag et al., 2015).

Based on the research results obtained by the frequency distribution for knowledge variables can be seen in Table 7.

Table 7. Distribution of Respondents Based on Knowledge of Immigrant Patients on Utilization of Health Services at Tamalanrea Health Center

Knowledge	(n)	(%)
Enough	35	59,3
Less	24	40,7
Amount	**59**	**100,0**

Source: primary data that has been processed, 2019

Based on Table 7 shows that of 59 respondents in Tamalanrea Health Center, 35 respondents (59.3%) had sufficient knowledge of the utilization of health services and as many as 24 respondents (40.7%) lacked knowledge of the utilization of health services.

g. Facilities : Based on the research results, the frequency distribution for facility variables can be seen in Table 8. Table 8 Distribution of Respondents Based on Facilities towards Utilization of Health Services at Tamalanrea Health Center.

Table 8. Distribution of Respondents Based on Facilities towards Utilization of Health Services at Tamalanrea Health Center

Facilities	(n)	(%)
Complete	34	57,6
Less complete	25	42,4
Amount	**59**	**100,0**

Source: primary data that has been processed, 2019

Based on Table 8, shows that of 59 respondents in Tamalanrea Health Center, 34 respondents (57.6%) stated that complete health facilities were used for health services and 25 respondents (42.4%) stated that health facilities were incomplete in the utilization of health services.

Table 9. Distribution of Respondents Based on Trust in the Utilization of Health Services at Tamalanrea Health Center

Trust	(n)	(%)
Believe	31	52,5
Lack of trust	28	47,5
Amount	**59**	**100,0**

Source: primary data that has been processed, 2019

Based on Table 9 shows that of the 59 respondents in Tamalanrea Health Center, 31 respondents (52.5%) expressed confidence in the utilization of health services and 28 respondents (47.5%) expressed less confidence in the utilization of health services.

1. Bivariate Analysis

Bivariate analysis was carried out to analyze the relationship between the independent variables (knowledge, facilities, and beliefs) and the dependent variable (utilization of health services at the Tamalanrea Health Center) by cross-tabulating using the chi-square test with $p < \alpha$ (0.05) the research hypothesis (Ho) is rejected, meaning that there is a relationship between the independent variable and the dependent variable.

Table 10. Effect of Knowledge with Utilization of Health Services at Tamalanrea Health Center

Knowledge	Utilization of health services				Amount		*p*
	To take advantage of		Haven't utilized				
	n	%	n	%	n	%	
Enough	26	74,3	9	25,7	35	100,0	**0,665**
Less	19	79,2	5	20,8	24	100,0	
Amount	**45**	**76,3**	**14**	**23,7**	**59**	**100,0**	

Source: primary data that has been processed, 2019

Table 10 shows that out of 35 respondents belonging to sufficient knowledge 26 respondents (74.3%) had utilized health services and 9 respondents (25.7%) had not utilized health services. While of the 24 respondents who lack knowledge, 19 respondents (79.2%) who have utilized health services and as many as 5 respondents (20.8%) who have not utilized health services at the Tamalanrea Health Center. Statistical test results obtained the value of p = 0.665 because the value of p> α = 0.665 <0.05 then Ho is accepted, this means that there is no relationship between the knowledge variable and the utilization of health services in the Tamalanrea Health Center. The results of this study are in line with the results of research conducted by (Karman and Saptaputra, 2017) which states that there is no significant relationship between knowledge and the utilization of health services in coastal communities in Bungie Permai Village Tinanggea District Konawe Selatan District based on the Chi-Square Test obtained ρ = 0.231> (α = 0.05) which means that H0 is accepted or Ha is rejected. Whereas the research (Pratiwi and Wahyono, 2017) shows the results of a bivariate analysis that knowledge has a relationship with the utilization of health services with a p-value of 0,000 (p <0.05). And the results of multivariate analysis show that good knowledge influences students in the utilization of health services in Puskesmas Unnes (p = 0,000; exp (B) = 11,341; 95% CI = 4,479-28,719). Knowledge is the dominant variable that is very important in the formation of one's actions.

Based on research (Marnah et al., 2016) the results show that the more understood the respondent related to health services, the respondent can determine the response/attitude towards the utilization of health services. This study was strengthened by the results of the study (Yaya et al., 2017) which showed that respondents with good knowledge about health services were 0.816 times more likely to utilize health services (p = 0.012) compared to respondents who had poor knowledge. Respondents' knowledge about seeking treatment may be influenced by many factors, such as experience and information facilities. Knowledge is not only obtained formally but also through experience, besides knowledge is also obtained through available information facilities such as the internet, radio, leaflets, and so on. Research in the field also produced information that many students did not know about Puslakes because they had never obtained information or socialization about the existence and function of Puslakes at Semarang State University. This shows that the low utilization of Puslakes by students is due to the low knowledge of students about Unnes Puslakes (Pratiwi and Wahyono, 2017).

The level of individual knowledge will greatly affect the awareness to participate in an activity and have an impact on behavior. But when analyzed further the process of formation of awareness is not only influenced by knowledge. Knowledge alone is not enough to make someone change his behavior. Change or adoption of behavior is a complex process and requires a relatively long time. In theory, a change in behavior a person accepts or adopts a new behavior in his life through three stages, namely knowledge, that is, before someone adopts a behavior (new behavior), he must know in advance what the meaning or benefit of the behavior is for himself or his family, an attitude that is after someone knows the stimulus or object, the next process will assess or behave towards the stimulus or health object, practice or action that is after someone knows the stimulus or health object, then conducts an assessment or opinion of what they know or react to (Notoatmodjo, 2003).

The results of this study are not in line with the results of research conducted by (Hasim, 2006) in (Rachmawati and Amir, 2014) in Kontunaga Village, Kontunaga District, indicating that the community knows whether or not what is and how the services provided at puskesmas are due to the lack of information they receive the function and role of the pusskesmas as well as the existing health service procedures at the puskesmas most of the respondents did not know the type of service and puskesmas service procedures as well as the community's perception that the puskesmas was the last place of treatment if it could not be treated by a shaman or self-medicated. Likewise, research conducted by (Wibowo et al., 2019) states that knowledge has a significant relationship to the utilization of health services based on the results of the Chi-square test (p-value <0.05) This means that Ho is rejected Ha accepted.

Based on research conducted by (Singal et al., 2019) with the test results of the relationship between knowledge and the use of Puskesmas by the Kima Bajo village community, the Chi-square statistical test results showed a value of p <0.05 so it can be concluded that there is a relationship between knowledge and utilization of health centers. Research conducted in the village of Kima Bajo can be seen that knowledge is related to the use of health center because only a small proportion does not utilize health center, because the community, in general, has been able to obtain knowledge about health through health education conducted by health workers in a health center.

Knowledge is the result of knowing and this happens after people have sensed a certain object. The process of seeing, witnessing, experiencing, or being taught greatly determines the occurrence of knowledge in a person. Knowledge is a very important factor in the formation of one's actions (over behavior). Because if someone does not know about an object, then the object will not be attractive to someone. Likewise, the use of health services, especially Puskesmas. One's knowledge can be obtained both from experience and from the educational bench which is the basis of one's insight and the means to make it easier for someone who receives new knowledge and behaviors the level of formal education one has ever acquired will increase knowledge of his reasoning power. Knowledge about health center can influence people's behavior in utilizing health center services to check their health. Knowledge is a very important role in providing insight into the form of attitude, which will then be followed by actions in choosing health services that are believed to be capable of. The level of knowledge influences the use of health center, if the community does not know about the benefits of the health center, then the community sees it as not important to utilize the health services provided (Karman and Saptaputra, 2017).

Table 11. Effect of Facilities with Utilization of Health Services at Tamalanrea Health Center

Facilities	Utilization of health services				Amount		*p*
	To take advantage of		Haven't utilized				
	n	%	n	%	n	%	
Complete	22	64,7	12	35,3	34	100,0	**0,015**
Less complete	23	92,0	2	8,0	25	100,0	
Amount	**45**	**76,3**	**14**	**23,7**	**59**	**100,0**	

Source: primary data that has been processed, 2019

Table 11 shows that out of 34 respondents who stated complete facilities as many as 22 respondents (64.7%) utilized health services in the high category and as many as 12 respondents (35.5%) utilized health services in the low category. Whereas of the 25 respondents who stated the facilities were incomplete as many as 23 respondents (92.0%) with a high category in utilizing health services and as many as 2 respondents (8.0%) utilized health services with a low category at the Tamalanrea Health Center. Statistical test results obtained the value of p = 0.015 because the value of p <α = 0.015 <0.05 then Ho is rejected, this means that there is a relationship between facility variables and the utilization of health services in Tamalanrea Health Center.

The results of this study are in line with the results of research conducted by (Wulandari, 2015) which shows the chi-square statistical analysis obtained the value of P = 0.013 means that Ho was rejected Ha accepted. This means there is a relationship between facilities and infrastructure with the utilization of health services by the Langara community. Also, research conducted by Adam (2014) stated that facilities (44.2%) and the good attitude of officers (46.7%) had a significant influence. The better facilities and attitudes of officers, the higher the level of utilization of health services in Indonesia Rural Communities in Southern Nigeria (Adam and Awunor, 2014). But different from the research conducted by (Tasya and Andriany, 2016) based on the results of the chi-square test obtained p-value = 0.648 (p> 0.05) which means that health facilities do not have a significant relationship with the utilization of dental and oral health services by patients at the Dental and Oral Hospital (RSGM) of Syiah Kuala University, Banda Aceh. If the patient feels comfortable with services in a hospital, then comfort will affect patient satisfaction, thus encouraging patients to come for treatment again.

Trust in this study relates to interactions between staff and patients, how much trust is needed in the utilization of health services. One of the factors that influence the utilization of health services is the level of trust in the health services provided. A good relationship between officers and patients will lead to trust and credibility by respecting what can be seen through acceptance, trust, empathy, keeping secrets, respecting and giving attention to patients.

Table 12. Influence of Trust with Utilization of Health Services at Tamalanrea Health Center

Trust	Utilization of health services				Amount		*p*
	To take advantage of		Haven't utilized				
	n	%	n	%	n	%	
Believe	19	61,3	12	38,7	31	100,0	**0,004**
Lack of trust	26	92,9	2	7,1	28	100,0	
amount	**42**	**76,3**	**58**	**23,7**	**59**	**100,0**	

Source: primary data that has been processed, 2019

Table 12 shows that of the 31 respondents who stated they believed as many as 19 respondents (61.3%) who had utilized health services and as many as 12 respondents (38.7%) who had not utilized health services. While of the 28 respondents who stated they lacked confidence, 26 respondents (92.9%) had

used health services and 2 respondents (7.1%) had not utilized health services at the Tamalanrea Health Center. This result is supported by research conducted by Ndikom (2012), which conducted a qualitative study of awareness and perceptions of the use of cervical cancer screening services among women in Ibadan, obtained the result that the belief to be at risk of cervical cancer would encourage them to screen, they also believed that it is important as for other diseases will help in early detection and treatment (Agustina, 2019). The results of research conducted by (Pratiwi and Wahyono, 2017) with statistical tests using chi-square showed the variable of trust in the disease has a significant relationship with the utilization of health services at the Unnes Health Center (p = 0.009). Based on the results of multivariate analysis, it shows that belief in disease affects students in the utilization of health services at the Unnes Health Center (p = 0.007; exp (B) = 21,064; 95% CI = 2,331-190,349). The interpretation of the logistic regression test is that respondents with a high level of trust in disputes are 21 times more likely to utilize health services at the Unnes Health Center than respondents with low trust in disease. The disease confidence variable is the variable that gives the most dominant influence in this study.

In contrast to the results of research conducted (Masita et al., 2017), the ρ value of 0.233 means ρ value> α (0.05) so that it can be concluded that Ho is accepted, meaning that there is no relationship between belief in health services and the utilization of health services in Tanailadu Village community in the Kadapa-Napa Community Health Center in Mawasangka District, Buton Tengah District in 2015. Relevant research results were also conducted by (Rachmawati and Amir, 2014), factors related to the utilization of health services in Tamanlanrea Public Health Center in Makassar City in 2014 which stated that there is no relationship between predisposing factors (beliefs) with the patient's decision to use the service. Based on the interview results from the questionnaire questions on the item "If the doctor did not come, do you entrust nurses to treat you?" Get an answer as much as 50.8% do not trust the nurse when the doctor did not come. Most of the reasons immigrants rely more on the ability of a doctor than a nurse, they do not believe that nurses can treat or understand the pain they suffer. So if they use health services they don't want to be examined if they are not a doctor.

IV. CONCLUSION

Based on the results of research on the factors that influence immigrant patients on the utilization of health services in Tamalanrea Health Center, conclusions can be drawn as follows: (1) Gender and age do not have an influence on the utilization of health services, sex has an influence on the utilization of health services in Tamalanrea Health Center and (2) There is an influence of facilities, and trust in the use of health services with the respective p-value: facilities p = 0.015 and trust p = 0.004. While knowledge has a value of p = 0.665 so that it does not influence the utilization of health services at the Tamalanrea Health Center.

The suggestions in this study are (1) Suggestions for Tamalanrea Public Health Center agencies that are to keep maintaining and further improving health services and health promotion in each community house of immigrants so that they are more interested and more entrusted to utilize health services when falling ill or have a complaint of ordinary illness and (2) Suggestions to the detention center to help promote and convince immigrants or refugees abroad that first-rate health services are able to provide the best health services.

V. REFERENCES

[1]. Abdullah, A., Sjattar, E. L. & Kadir, A. R. 2017. Faktor Penyebab Terjadinya Penurunan Jumlah Kunjungan Peserta Program Pengelolaan Penyakit Kronis (Prolanis) di Puskesmas Minasa Upa Kota Makassar. Jurnal Ilmiah Kesehatan Diagnosis, 11, 382-387.

[2]. Agustina, S. 2019. Persepsi Sakit, Pengetahuan dan Kepuasan dengan Pemanfaatan Pelayanan Kesehatan di Puskesmas. HIGEIA (Journal of Public Health Research and Development), 3, 274-285.

[3]. Damayanti, M., Jati, S. P. & Arso, S. P. 2017. Analisis Permintaan Masyarakat Terhadap Pelayanan Rawat Jalan Rumah Sakit Umum Daerah Dr. R. Soetijono Blora. Jurnal Kesehatan Masyarakat (e-Journal), 5, 85-94.

[4]. Dong, G. N. 2016. Earnings management in US hospitals. Journal of health and human services administration, 41-71.

[5]. Indar, 2017. Etikolegal dalam Pelayanan Kesehatan. Yogyakarta: Pustaka Pelajar.

[6]. Karman, K. & Saptaputra, S. 2017. Faktor-Faktor Yang Berhubungan Dengan Pemanfaatan Pelayanan Kesehatan Bagi Masyarakat Pesisir Di Desa Bungin Permai Kecamatan Tinanggea kabupaten Konawe Selatan Tahun 2016. Jurnal Ilmiah Mahasiswa Kesehatan Masyarakat, 1.

[7]. Marnah, M., Husaini, H. & Ilmi, B. 2016. Analisis Perilaku Masyarakat dalam Pemanfaatan Pelayanan Kesehatan Peserta Program Keluarga Harapan (PKH) di Kecamatan Paminggir. Jurnal Berkala Kesehatan, 1, 130-138.

[8]. Notoatmodjo, S. 2003. Pendidikan dan perilaku kesehatan. Jakarta: rineka cipta, 16, 15-49.

[9]. Nst, E. D. 2018. Peranan International Organization For Migration (IOM) Dalam Menangani Permasalahan Refugees (Pengungsi) Rohingya Di Indonesia. Jurnal Power in International Relations (PIR), 2, 70-81.

[10]. Pratiwi, A. & Wahyono, B. 2017. The Pemanfaatan Pusat Layanan Kesehatan (Puslakes) Universitas Negeri Semarang. HIGEIA (Journal of Public Health Research and Development), 1, 49-60.

[11]. Rachmawati, D. & Amir, M. 2014. Faktor Yang Berhubungan Dengan Pemanfaatan Pelayanan Kesehatan Di Puskesmas Tamalanrea Kota Makassar.

[12]. Rumengan, D. S., Umboh, J. & Kandou, G. 2015. Faktor-faktor yang berhubungan dengan pemanfaatan pelayanan kesehatan pada peserta BPJS kesehatan di Puskesmas Paniki Bawah Kecamatan Mapanget Kota Manado. Jikmu, 5.

[13]. Singal, H. I., Kandou, G. D. & Rumayar, A. A. 2019. Hubungan Antara Pengetahuan, Sikap Dan Pendapatan Dengan Pemanfaatan Puskesmas Oleh Masyarakat Desa Kima Bajo Kecamatan Wori. Kesmas, 7.

[14]. Tasya, N. & Andriany, P. 2016. Faktor-Faktor Yang Berhubungan Dengan Pemanfaatan Pelayanan Kesehatan Gigi Dan Mulut di Rumah Sakit Gigi Dan Mulut (RSGM) Universitas Syiah Kuala Banda Aceh. Journal Caninus Dentistry, 1, 54-62.

[15]. Wahyuni, N. S. 2012. Faktor-Faktor yang Berhubungan dengan Pemanfaatan Pelayanan Kesehatan di Puskesmas Sumber Rejo Kota Balikpapan Provinsi Kalimantan Timur Tahun 2012. AWSAccessKeyId= AKIAIWOW YYGZ2Y53UL3A&Expires= 1533197103&Signature= Ad% 2F2b1vl0CA 1EUaN% 2Fieq8SzA1U4% 3D&response-contentdisposition= inline% 3B% 20filename% 3DFile_pemanfaatan kesehatan_di_ puskesmas. pdf.

[16]. Wibowo, W., Su'udi, A. & Sahir, M. 2019. Pengaruh Perubahan Iklim Terhadap Insiden Malaria Di Wilayah Keja Dinas Kesehatan Kabupaten Gowa Propinsi Sulawesi Selatan Tahun 2017. Media Kesehatan Politeknik Kesehatan Makassar, 14, 60-65.

[17]. Yang, P. Q. & Hwang, S. H. 2016. Explaining immigrant health service utilization: a theoretical framework. Sage Open, 6, 2158244016648137.

[18]. Yaya, S., Bishwajit, G. & Ekholuenetale, M. 2017. Factors associated with the utilization of institutional delivery services in Bangladesh. PLoS One, 12, e0171573.

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Free Energy Generation Using Flywheel

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ABSTRACT

The aim of our project is to generate free energy using flywheel. A mains motor of two horsepower capacity is used to drive a series of belt and pulley drive which form a gear-train and produces over twice rpm at the shaft of an alternator. The intriguing thing about this system is that greater electrical output power can be obtained from the output of the alternator than appears to be drawn from the input motor. This is done with the help of Flywheel. The gravity wheel or flywheel is coupled with the gear-train in order to produce more excess energy or free energy. Detail study is done with various parameters of flywheel to obtain the maximum free energy out of the system.

Keywords : Motor, Flywheel, Alternator, Bearings, Shafts, Pulleys, Belts.

I. INTRODUCTION

The term Free-Energy generally means a method of drawing power from the local environment, without the need to burn a fuel. There are many different successful methods for doing this and these methods span many countries and many years. The amount of power which can be collected can be very high and the few kilowatts needed to power a household are most definitely within the reach of most of the devices mentioned.

Free energy means zero cost energy. Mechanical energy which drives windmill or Solar energy in solar cell which is converts into DC current other energies obtained are from wind power, water power & telluric power. Free energy generator is a process to generate these types of energy. Free energy suppression is the notion that corporate energy interests intentionally suppress technologies that may provide energy at very low cost. Other remaining untouched forces of nature which are well familiar in the scientific literature include earth batteries, atmospheric electricity, telluric currents, and pressure system changes. The energy from perpetual motion is considered fantastical forces. These devices utilize quantum vacuum energy, quantum vacuum perturbation, rotating magnets and purported methods to crack hydrogen.

Free energy suppression is the notion that corporate energy interests intentionally technologies that may provide energy at minimum cost. All other remaining untouched forces of nature which are well familiar in the scientific literature, which includes earth batteries, atmospheric electricity, telluric current and pressure system changes.

Nikola Tesla once said that, all people should have energy sources for free. There is electricity everywhere present in limitless quantities and can

drive the world's equipment without the need for gas, coal or oil.

Free Energy generally means a method of drawing power without fuel to be burnt from the local environment. There are many different ways for doing this. These ways span many years and countries. The amount of power which can be obtained can be very high and the few kW needed to power a household are most definitely within the reach.

The bottom line is that energy can definitely be drawn from the local environment in sufficient quantities to supply all of our needs. For whatever reason, conventional science appears determined not to accept this basic fact and denies it at every opportunity. It seems likely that vested financial interests are the root cause of this refusal to accept the facts. The true scientific method is to upgrade scientific theory in the light of observed fact and new discoveries, but the true scientific method is not being followed at the present time.

II. LITERATURE REVIEW

S.U.Maji , M. S. Mane C, Kshirsagar, A. Jagdale, D. Malgar has worked on free energy using flywheel. This Paper deals with the concept of free energy and its generation using flywheel system. A mains motor of half horsepower capacity is used to drive a series of belt and pulley drive which form a gear-train and produces over twice rpm at the shaft of an alternator. The intriguing thing about this system is that greater electrical output power can be obtained from the output of the alternator than appears to be drawn from the input motor. This is done with the help of Gravity wheel. The gravity wheel or flywheel is coupled with the gear-train in order to produce more excess energy or free energy. Detail study is done with various parameters of flywheel to obtain the maximum free energy out of the system.[1]

Siddharth Shroti has worked on Free Energy Generation Advanced Research. A mains motor of capacity (1/4horsepower) is used to drive a series of belts and pulleys which form a gear-train which produces over twice the rotational speed at the shaft of an electrical generator. The intriguing thing about this system is that greater electrical power can be drawn from the output generator than appears to be drawn from the input drive to the motor. How can that be? Well, Mr Tseung's gravity theory explains that if a energy pulse is applied to a flywheel, then during the instant of that pulse, excess energy equal to 2mgr is fed into the flywheel, where "m" is the mass (weight) of the flywheel, "g" is the gravitational constant and "r" is the radius of the centre of mass of the flywheel, that is, the distance from the axle to the point at which the weight of the wheel appears to act. If all of the flywheel weight is at the rim of the wheel, the "r" would be the radius of the wheel itself. This means that if the flywheel is driven smoothly at constant speed, then there is no energy gain. However, if the drive is not smooth, then excess energy is drawn from the gravitational field. That energy increases as the diameter of the flywheel increases. It also increases as the weight of the flywheel increases. It also increases if the flywheel weight is concentrated as far out towards the rim of the flywheel as is possible. It also increases, the faster the impulses are applied to the system.[2].

Akhilesh Barwahe, Amrendra Kumar, Ankit Domde, Deepak Dhakad, Manish Kumar Dhadse, Vishal Wankhade has worked on electricity generation using flywheel— Flywheels have been under consideration to be used for energy storage purposes. In developing countries like India, with rapid growth in the economy, the demand for electricity is also

increasing. With the rising demand for reliable, cost-effective, and environmentally friendly energy storage, the Flywheel Energy Storage System FESS is quickly coming into its own. This study presents an analysis which shows that using an FESS is a promising alternative in mitigating energy storage problems in decentralized electricity generation projects where an uninterrupted power supply UPS is required. An electrical machine is used as a motor to store kinetic energy when the solar energy is available, and then the stored energy is converted back to electrical energy by running the machine as a generator when the solar energy is no longer available. Flywheel Energy Storage systems FESS using advanced technology have come up as a promising alternative to the traditional electrochemical battery. The amount of energy storage depends on the mass, flywheel shape, and rotational speed of the rotor. A FESS can have energy fed into the rotational mass of a flywheel, store it as kinetic energy, and release it upon demand. Keywords [3].

Sudipta Saha, Abhik Bose, G. SaiTejesh, and S.P. Srikanth has worked on Analysis of Flywheel. The importance of the flywheel design specification selection and its contribution in the energy storage performance. This contribution is demonstrated on the example cross-sections using computer aided analysis and optimization procedure. This Proposed Computer aided analysis and optimization procedure results shows that suitable design of flywheel geometry design could both have a significant effect on the Specific Energy performance and minimize the operational loads exerted on the shaft/bearings due to reduced mass at high rotational speeds.[4].

Yadav R , Punith P , Sharatbabu, Dr. Jyothi P Koujalagi has worked on flywheel based bicycle generator. Transportation is very important connecting people from different places. A mode of transport is a solution that makes use of a particular type of vehicle, with the increase in population the number of vehicles on road is also increasing. The transportation plays a major impact on environmental-creates air pollution, including nitrous oxide and other particulates and is a significant contributor to global warming through emission of co2. This paper presents a Flywheel based Bicycle Generator. A mode of transportation due to their low cost, ease of use, health benefits and mobility. The main objective of this paper is to convert the rotational energy of rare wheel of the bicycle into electrical energy so that we can recharge the battery.[5]

III. DESIGNING AND CALCULATION

In this System Design We Mainly Concentrate on the Following Parameters which can be seen in the fig. 3.1.The system consists of design of various parts like Pulley, Flywheel, Belt drive, Shaft, Bearings etc.

1) Design of Shaft and Bearings: There are 2 shaft in the Layout of the system. Thus Design of Shaft is to be calculated in order to find the proper Shaft diameter which would withstand the load easily and to ensure the maximum energy is transfer with minimum loss. Bearing selection is also some important criteria in order to ensure smooth and long lasting functioning of the system.
2) Design of Belt Drive: At the first stage we selected pulley as per standard specification. We know that a belt drive is useful for the power transmission using pulley. Each pulley has different diameters and speed. The belt, wire (rope) drives are used for the power transmission. In the project, we are going to use total six pulleys, so we need three different belt drives.

3) Design of Flywheel: This Project is all about generation of free energy with using the gravitational energy. Thus we are using flywheel of mass 10kg that can utilize the gravitational energy and give us more output.

A. Calculation

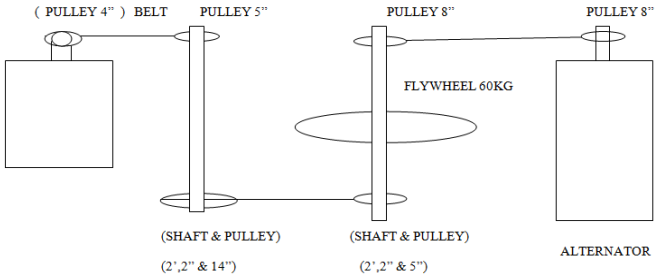

Fig.3.1 Line Diagram

Considered input data

Power **P** = 2HP = 1.419 kW

N_1 = Speed of driver pulley = 1440 rpm

d_1 diameter of driven pulley = 203.2 mm

Fly wheel diameter = 2ft = 609.6 mm

Mass of the flywheel = 60 kg

d_2 = diameter of driver pulley = 101.6 mm

1) SHATF DESIGN

Yield stress σ_y = 250 N/mm2,

Length of the shaft L=609.6mm,

Density of mild steel ρ =1.491kw

$\tau_{max} = \frac{0.5\ \sigma y}{fos} = \frac{0.5X250}{3} = 41.66 N/mm^2$

Torque = $\mathbf{M_t} = \frac{60X10^6XKW}{2\pi n} = \frac{60X10^6X1.491}{2\pi X720}$

$\mathbf{M_t}$ = 19772.43 Nmm

Bending Moment

For pulley 1:

$(P_1 - P_2)Xd_1 = M_t$

$(P_1 - P_2)X101.6 = 19772.43$

$P_1 - P_2 = 194.67$

$P_1 - P_2 = e^{\frac{\mu\alpha}{\sin\frac{\theta}{2}}}$

For V- Belt , θ = 40, μ = 0.2

$\alpha = 180 - 2 \times \sin^{-1}\frac{d_2 - d_1}{2c}$

$C = (d_1 + d_2) + 100 = 101.6 + 203.2 + 100$

$C = 404.8$

$\alpha = 180 - 2\sin^{-1}\frac{203.2 - 101.6}{2 X 404.8}$

$\alpha = 172.77$

$\frac{P_1}{P_2} = e^{\frac{0.2X172.77}{\sin 20}} = 2.203$

$P_1 = 356N$

$P_2 = 161.82N$

$P_1 + P_2 + W = 356 + 161.82 + 0.9x81 = 527.20$

$M_A = 637.65 \times 204.8 - 527.20 \times 100$

$= 130590.72 - 52720$

$M_A = 77870.72Nmm$

Pulley 2:

$(P_1 - P_2)X177.8 = 19772.43$

$P_1 - P_2 = 111.206$

$\alpha = 180.2 \times \sin^{-1}\frac{345.6 X 6 X 101.6}{2 X 556}$

$\alpha = 154.95$

$\frac{P_1}{P_2} = e^{0.2X\frac{154}{\sin 20}} = 2.223$

$P_1 = 2.223P_2$

$1.223P_2 = 111.206$

$P_1 = 202.134N$

$P_2 = 90.92N$

$= P_1 + P_2 + W = 90.92 + 202.134 + 0.9 X 9.81$

$= 301.883$ N

$M_B = 637.65 X 204.81 - 301.883 X 100$

$M_B = 130590.72 - 30188.3$

$M_B = 100402.42$ Nmm

$\tau_{max} = \frac{16}{\pi d^3}\sqrt{(100402.42)^2 + (19772.43)^2}$

$d^3 = \frac{16}{\pi X 41.66}\sqrt{(100402.42)^2 + (19772.43)^2}$

$= \frac{16}{\pi X 41.66}\sqrt{(10471594930)}$

$= \frac{39301.319}{\pi} = 12508.377$

d = 23.213 mm

For safe operation with considering vibration parameter 2 inch diameter shaft is selected.

d = 50.8 mm

2) Selection of bearing

Speed of shaft N_2 = 720 rpm

L_{10h} = 20000

P (P_1 + P_2+ W_1) = 527.2 N

Bearing Life

$$L_{10} = \frac{60 \text{ x n x } 40h}{10^6} = \frac{60 \text{ x } 720 \text{ x } 20000}{10^6}$$

$$L_{10} = 864$$

Dynamic Load Capacity

$$C = P\,(L_{10})^{\frac{1}{3}} = 527.2 \text{ X } (864)^{\frac{1}{3}}$$

C = 5021.26 N

50 BC 02 or 55 BC 02

Selected as: $C_{50} = 27070$ N , $C_{55} = 33340$ N

Similarly Bearing 2: P = 301.883 N

$$L_{10} = \frac{60 \text{ X n X } 40h}{10^6} = \frac{60 \text{ x } 720 \text{ x } 20000}{10^6} = 864$$

$$C = 301.883 \text{ x } (864)^{\frac{1}{3}}$$

C = 2875.25 N

As per standard bearing capacity C

Bearing No. For d= 50.8 mm

3) Belt Drive

For the first two pulleys

We know that $\frac{d_2}{d_1} = \frac{N_1}{N_2} = \frac{203.2}{101.6} = \frac{1440}{N_2}$

N_2= 720 rpm

Now Select Correction Factor According To Service For System From Design Data Book $F_a = 1.2$

Design power P_d = service factor X power to be transmitted

$$= 1.2 \text{ x } 1.491$$

$$P_d = 1.7892 \text{ kW}$$

We select the v-belt type according to power transmission, we select as 'B' type V-belt from the design data book

Normal thickness t (mm) = 11 mm

Width = 17 mm

Velocity = 25 m/sec

Max. no of strands = 9

Assume centre distance between two pulleys

$$C = d_1 + d_2 + 100 = 203.2 + 101.6 + 100 = 404.8 \text{ mm}$$

C= 405mm

Now we find the length of the belt used for drive

$$L = 2C + \frac{\pi(d_1+d_2)}{2} + \frac{(d_2-d_1)^2}{4C}$$

$$= 2 \text{ x } 405 + \pi \frac{(203.2+101.6)}{2} + \frac{(203.2-101.6)^2}{4 \text{ x } 405}$$

$$L = 810 + 478.84 + \frac{(101.6)^2}{1620}$$

L = 1295.211mm

L_P = 1491mm

Selected B type 57

$$1491 = 2C + \pi \frac{(203.2+101.6)}{2} + \frac{(203.2-101.6)^2}{4 \text{ x } C}$$

$$1012.16 = 2C\frac{(101.6)^2}{4C} = 2C + \frac{2580.64}{C}$$

$1012.16C = 2c^2 + 2580.64$

$F_c = k_c$ = Correction factor for belt pitch length for system from table = 0.88

Are

$$\alpha = 180 - 2 \text{ x } \sin^{-1}\frac{d_2-d_1}{2C}$$

$$= 180 - 2 \text{ x } \sin^{-1}\frac{202.2-101.6}{2}$$

4) Fly wheel

$$K.E = \frac{1}{2} IW^2$$

Input Rpm to Wheel

$$\frac{N_1}{N_2} = \frac{d_2}{d_1} = \frac{1440}{N_2} = \frac{5}{4}$$

$N_2 = 1152$ rpm

$$\frac{N3}{N4} = \frac{d4}{d3} = \frac{1152}{N4} = \frac{5}{16}$$

N_4= 3686.4

K=0.9 fly wheel with rim/rib

m = 60kg

$I = Kmr^2$

$I = 0.9 \times 60 \times 9.81 \times 0.3048^2$

$I = 49.214$ Kg-m^2

$$W = \frac{2\pi n}{60} = \frac{2 \times \pi \times 3686.4}{60} = 386.038$$

W^2= 149025.337 rad/sec

$$K.E = \frac{1}{2} \times 49.214 \times 149025.337$$

K.E = 3667066.468 N-M

IV. WORKING PRINCIPLE AND COMPONENT USED

A. Working Principle

In free energy generation process the motor with 4 inch pulley runs the shaft on which the two pulleys are fitted with the help of belt. Motors pulley is connected with 5 inch pulley which is fitted on one end of shaft with the help of belt. The motor and the shaft1 rotates at same speed. The other end of the shaft1 on which 14 inch pulley is fitted drives the another shaft that is shaft2 on which different dimensions of pulleys and one flywheel is fitted. This 14 inch pulley is connected with the 5 inch pulley which is fitted on the one end of shaft2 with the help of belt. which twice the speed of shaft2. Due to this the flywheel which is fitted on the shaft rotates with high speed and stores the energy. The other end of the shaft2 on which 8 inch pulley is fitted drives the alternator with the help of pulley and belt. The energy stored in the flywheel is supplied to run the alternator to produce maximum amount of current required. When the maximum amount of current is generated in the alternator this current is supplied to the motor with the help of electrical connection to run the motor . The electric supply which we have first used to run the motor is disconnected and the current produced in the alternator is used to run the motor. Now with the help of shaft, pulleys, and belts the alternator runs the motor and vice versa. Due to this the free energy is produced.

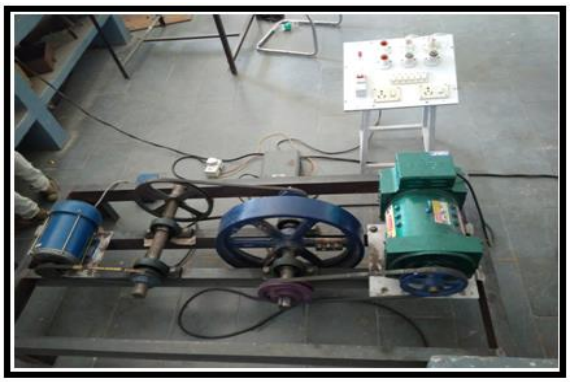

Fig. 4.1.1 Assembled Model

B. Components Used

1) AC Motor: An AC motor is an electric motor driven by an alternating current AC. An AC motor of 2HP is used to rotate the flywheel using 2 shafts. Specification of AC motor as mentioned in the table below.

TABLE I

SPECIFICATIONS OF AC MOTOR

S. No	Specifications	Units
1	1.5	kW
2	2	HP
3	1440	RPM
4	190/230	Volts
5	1	Phase
6	11.5	AMP

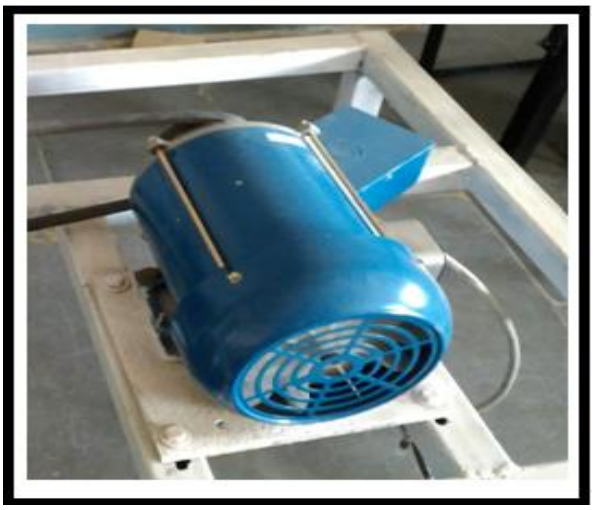

Fig. 4.2.1 AC motor

2) Alternator: An alternator is an electrical generator that converts mechanical energy to electrical energy in the form of alternating current. 5KV alternator is used to generate electric current with the help of flywheel stored energy. The maximum RPM of alternator used is 1500RPM.the detailed specification of alternator is shown in table below.

TABLE II. SPECIFICATIONS OF ALTERNATOR

S. No	Specifications	Units
1	5	KVA
2	1	Phase
3	1500	RPM
4	18	AMP
5	230	Volts

Fig. 4.2.2 Alternator

3) Flywheel: A flywheel is a mechanical device which stores rotational energy. A rib type flywheel of 22 inches diameter is used to store energy. This stored energy is transformed through the belt drives to the alternator for generation of electricity. figure 4 shows flywheel mounted on c-chanel frame.

Fig. 4.2.3 Flywheel

4) Shaft: A shaft is a rotating machine element, which is used to transmit power from one part to another part using transmission element such as pulleys and gears. Two shaft of length 2ft and 2 inch diameter is used to transmit the motion for AC motor to flywheel.

Fig. 4.2.4 Shaft

5) Pulley: A pulley is a wheel on an axle or shaft that is designed to support movement and change of direction of a taut cable or belt, or transfer of power between the shaft and cable or belt. Six pulleys of different diameters are used to transmit motions.

Fig. 4.2.5 Pulley

6) Belt: A belt is a loop of flexible material used to link two or more rotating shafts mechanically, most often parallel. Belts may be used as a source of motion, to transmit power efficiently or to track relative movement. Belts are looped over pulleys and may have a twist between the pulleys, and the shafts need not be parallel.

Three V- type belts of specified length are used to couple two shafts, motor, flywheel and generator. figure 7 shows V-type section B-belt.

Fig. 4.2.6Belt

7) Structural frame: Structural frame is used to transmit the loads and vibrations of rotating members to ground. C-Chanel frame of 2 inch thickness, 6 ft length and 3 ft width is used to carry all the components. Figure 8 shows the fabricated model of C frame structure.

Fig. 4.2.7 C-Chanel Frame

8) Bearings: A bearing is a machine element that constrains relative motion to only the desired motion, and reduces friction between moving parts. Four journal bearing of diameter 2 inches is used to support shaft 1 and 2.

Fig. 4.2.8 Journal Bearings

V. FABRICATION

A. Boring

In machining boring is the process of enlarging a hole that has already been drilled or cast by means of a single-point cutting tool or of a boring head containing several tools. A hole of 2 inch diameter is bored in 4 pulleys and other 2 pulleys are bored with a diameter of 1 inch to fix these pulleys on shaft.

Fig. 5.1.1Boring of pulley

B. Keyway

Keyway is a machining process which is performed on the shafts to hold the pulleys. A slot of 4 mm length is machined on both the shafts to grip the pulleys using keys.

Fig. 5.2.1 Key Way on Shaft

C. **MIG Welding**

MIG welding is an arc welding process in which a continuous solid wire electrode is fed through a welding gun and into the weld pool, joining the two base materials together. By using MIG welding the structural C-Chanel are welded to make structural frame for mounting all the components on it.

Fig. 5.3.1 MIG Welding

D. **Drilling**

Drilling is a cutting process that uses a drill bit to cut a hole of circular cross-section in solid materials. A 1 inch diameter holes are drilled on the structural C-Chanel frame for fixing of all components on it.

Fig. 5.4.1 Drilling of C-Chanel

E. **Cutting**

Cutting is the separation of a physical object, into two or more portions, through the application of an acutely directed force. On cutting machine two C-Channels of 20ft each are cut into 6 different lengths in which 4 are of 6ft and 2 are 3ft.

Fig. 5.5.1 Cutting of C-Chanel

F. **Fitting**

After all above the operations by using nuts and bolts all the components used are mounted on the structural C-Chanel frame.

Fig. 5.6.1 Assembled Model

TABLE III. TESTING

S. No	Specimen	Speed(RPM)
1	Speed of Shaft 1 N_2=N_3	1200
2	Speed of Flywheel N_4	2200
3	Speed of Generator	1550

K.E = $\frac{1}{2}IW^2$

I = Kmr^2

I = $0.9\times60\times9.81\times 0.3048^2$

I = 49.214 Kg-m^2

W = $\frac{2\pi N4}{60} = \frac{2\times\pi\times}{60} = \mathbf{230.38}$

W^2= 53074.944rad/sec

K.E = $\frac{1}{2}\times 49.214 \times 53074.944$

K.E = 1306015.147N-MTesting

V. CONCLUSION

Energy stored in the flywheel through 2 HP motor has been utilized to run the generator to produce electricity for running of 2HP motor and remaining energy to utilize for other electric equipments. Hence through this methods free energy has been utilized for domestic purpose.

The other main advantage of Conventional Free energy using flywheel is that it can generate energy without extra equipment and this free energy generation is nonhazardous and environmental friendly. Can be use in various applications like electric fuel cars, and increase the efficiency of traditional electrical Equipment's

VI. REFERENCES

[1]. S.U.Maji , M. S. Mane C, Kshirsagar, A. Jagdale, D. Malgar , "free energy using flywheel" IJSRD - International Journal for Scientific Research & Development, Volume 4, Issue 02, 2016 ISSN : 2321-0613.

[2]. Siddharth Shroti "Free Energy Generation Advanced Research" imperial Journal of Interdisciplinary Research (IJIR) Vol-3, Issue-4, 2017 ISSN: 2454-1362

[3]. Akhilesh Barwahe, Amrendra Kumar, Ankit Domde, Deepak Dhakad, Manish Kumar Dhadse, Vishal Wankhade, "electricity generation using flywheel" International Journal for Research in Applied Science & Engineering Technology (IJRASET), Volume 4 Issue IV, April 2016,ISSN: 2321-9653.

[4]. Prof. Bharat M. Jibhakate, Jayant P. Karemore, Jitendra D. Jaiswal, Kapil V. Kalambe, Nilesh S. Zade, Sitleshkumar K. Sonkalihari, "review of free energy generator using flywheel" International Research Journal of Engineering and Technology (IRJET), Volume: 04 Issue: 02 Feb -2017, ISSN: 2395 -0056.

[5]. Kumud Pant, Jyoti Mehra1, Ketan Naula, Sunil Singh and Mr. Ambedkar Rai "Electricity Generation using Flywheel" International Journal on Emerging Technologies (Special Issue NCETST-2017) 8(1): 582-584(2017), ISSN No: 2249-3255.

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Design and Fabrication of Water Phantom for Treatment Verification in High Dose Rate (HDR) Brachytherapy of the Cervix

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ABSTRACT

The aim of this study is to design and fabricate a local anatomical water phantom for dose distribution measurements during high dose rate brachytherapy of the cervix. Phantoms for dosimetry are used when there is a need to simulate the conditions of a procedure to measure dose at certain points of interest. It is dangerous to place a human being in a beam for dose measurements. Perspex (PMMA) sheets of thickness 6mm and 10mm were used for fabricating the phantom. The phantom designed is curved in shape with a predominantly 6mm thickness of the perspex material. It has a height of 41cm and breadth 31cm. The pieces of perspex material were glued to each other using Trichloromethane (chloroform) at room temperature. It is an organic compound with the formula CHCI3. A perspex sheet of 10mm was used to make one end of the phantom thicker than the other. This was done to support the reconstruction box. Two thin film holder slabs of dimensions 31.5 × 2.8 cm^2 were fabricated by joining two sheets of 6 mm perspex together with the chloroform. A small cavity of 2.8 × 2.5 cm2 was created in the slab to represent the bladder and the rectum (organs at risk). These same cavities are meant to hold the detectors (films) in place for the measurement of dose to the organs at risk. The film holders with the cavities were then positioned vertically, but anterior and posterior to each other. Another holder, rectangular in shape was fabricated to hold the film holders. This holder was made from perspex sheets of thickness 6mm and 10mm with dimensions of 6.8 × 6.8 cm2. This is to allow for the distances between the bladder and the rectum to be varied during the dose measurements. It must be noted that the anatomical distance between the bladder and the rectum which are posterior and anterior to the cervix vary from patients to patients. Special clamping devices were fabricated to hold the applicators in a firm position during the intracavitary brachytherapy insertions. These special clamps were made by joining perspex of 10mm thickness in a cuboid shape; a hole was drilled in them to enable a plastic screw to lock the applicators.The relative electron density of the phantom designed was determined to be 1.069 which is comparable to water. This makes the phantom suitable for dose distribution measurements.

Keywords : Perspex Sheets, Phantom, Dose, HDR Brachytherapy

I. INTRODUCTION

Dosimetry investigations in radiotherapy involve mostly the use of phantoms. This is because the Perspex materials used in the construction of these phantoms mimic the anatomical properties of the human tissues. Phantoms therefore, represent the human body and have been in use for investigations as far as treatments with radiations are concerned.

In 1896, after Wilhelm Conrad Rontgen discovered x rays, her wife's hand was first used for the world's first ever x ray images. The effects were harmful due to high doses of radiation received and that resulted in erythema and cell squamation. As a result, nobody was willing to volunteer for radiation exposures meant for experimental purposes. This is what led to the development of phantoms by physicists to simulate patients for dose measurements and to also verify the effectiveness of the system.

In designing a phantom, the materials are selected based on the intended use of the phantom. The thickness of the material, the size, shape of the phantom fabricated will depend on what it is fabricated for. Phantoms that are meant to use dosimeters like film or TLDs also have different designs and fabrications. Every material used in the phantom design must simulate human tissues, but the properties of these materials vary with the amount of radiation energies incident upon them. The materials will be tissue equivalent based on a range of energies they receive; they cannot be tissue equivalent over all range of energies.

OBJECTIVE

The objective of this study is to design and fabricate a local anatomical water phantom for dose distribution measurements during high dose rate brachytherapy of the cervix.

II. METHODS AND MATERIAL

MATERIALS

The following materials were used in construction the phantom for dose distribution measurement: Perspex(PMMA) sheets of thickness 6mm and 10mm, Trichloromethane (chloroform) and a tape measure.

METHOD

Perspex (PMMA) sheets of thickness 6 mm and 10 mm were used in the entire design as shown in figure 1. CT images of a real patient's cervical region were obtained from the CT scanner and these were used in constructing the bladder and rectal region of the cervix phantom.

The phantom designed is cuboid in shape with predominantly 6 mm thickness of the perspex material. It has a height of 41 cm and breadth 31 cm. The pieces of perspex material were glued to each other using Trichloromethane (chloroform) at room temperature. The chloroform was used to join the perspex sheets together. It is an organic compound with the formula $CHCI_3$. Chloroform is a colorless, volatile liquid derivative of Trichloromethane with an ether-like odour. It can be used as a solvent to bond pieces of acrylic glasses together.

A perspex sheet of 10mm was used to make one end of the phantom thicker than the other. This was done to support the reconstruction box. Two thin film holder slabs of dimensions $31.5 \times 2.8\ cm^2$ were fabricated by joining two sheets of 6 mm perspex together with the chloroform.

A small cavity of $2.8 \times 2.5\ cm^2$ was created in the slab to represent the bladder and the rectum. These same cavities are meant to hold the gafchromic films in place for the measurement of dose to the bladder and the rectum which are the organs at risk (OAR) in the treatment of cervical cancer. The film holders with the cavities were then positioned vertically, but anterior and posterior to each other in the cuboid shaped water phantom designed.

Another holder, rectangular in shape was fabricated to hold the film holders. This holder was made from

perspex sheets of thickness 6 mm and 10 mm with dimensions of $6.8 \times 6.8\ cm^2$. This is to allow for the distances between the bladder and the rectum to be varied during the dose measurements. It must be noted that the anatomical distance between the bladder and the rectum which are posterior and anterior to the cervix vary from patients to patients.

Special clamping devices were fabricated to hold the applicators in a firm position during the intracavitary brachytherapy insertions. These special clamps were made by joining perspex of 10 mm thickness in a cuboid shape; a hole was drilled in them to enable a plastic screw to lock the applicators. Figure 1 depicts the fabricated phantom.

The relative electron density of the perspex sheet used in the entire design was determined to be 1.069 which is comparable to that of water. This makes the phantom suitable for dose distribution measurements. The cross sectional view of the phantom is shown in figure 2.

III. RESULTS AND DISCUSSION

The phantom was design to meet certain design criteria so that it can test realistic anatomic clinical situations. The relative electron density of the perspex sheet used in the entire design was determined to be 1.069 which is comparable to water. This makes the phantom suitable for dose measurements. The perspex materials used mimic radiological properties when irradiated. The phantom was filled with water because greater part of the human body weight is made up of water. Water was used as substitute for tissues and bones.

The human adult body is made up of 60% water. The brain and heart are composed of 73% water, and the lungs are about 83% water. The skin contains 64% water, muscles and kidneys are 79%, and even the bones are 31%. (H.H. Mitchell, 1945) Water is an appropriate material because it has the advantage of conducting electricity as required for electron measurements (Glabraith et al., 1984) and is universally available. The PMMA material used in constructing the phantom and the water are homogenous; they are the only substitute for tissue and muscles in a real patient when considering BT treatment.

Dosimetry protocols require that dose measurement test be carried out using phantoms because it is very risky and dangerous using real patients for such tests since exposure to radiations could cause cancers. The phantom constructed gave very good and convincing results and therefore can be used for further in vivo dosimetry at the centre. The phantom constructed gave very good and convincing results and therefore can be used for further in vivo dosimetry study.

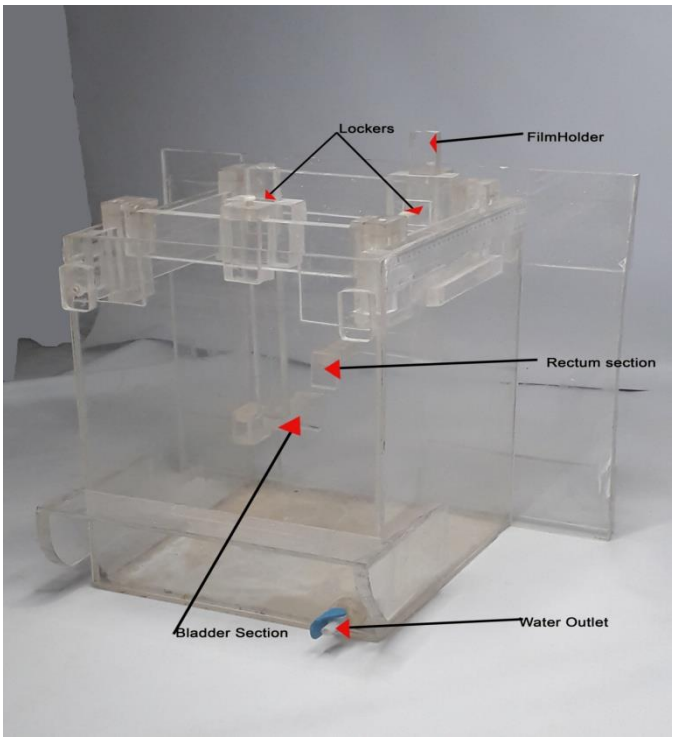

Figure 1 : Locally constructed water phantom

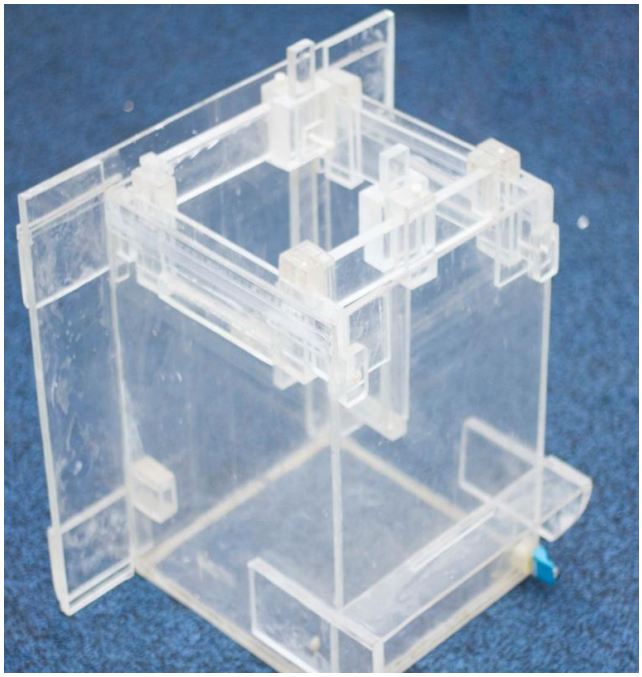

Figure 2 : Cross sectional view of the locally constructed water phantom

IV. CONCLUSION

The results from this research suggested that the locally constructed phantom is suitable and can be used for dose distribution measurements and system verification during high dose rate (HDR) brachytherapy of the cervix. The results have shown that the fabricated phantom mimic radiological and anatomic properties of tissues, hence make it suitable for dose distribution measurements and further research work relating to cervical cancer. The perspex materials mimic radiological properties and can be used for constructing any local phantom for research purposes. The electron density of the perspex materials is comparable to that of water.

V. RECOMMENDATION

The phantom constructed from this study gave convincing results and it is therefore recommended for clinical applications.

VI. REFERENCES

[1]. Galbraith, D.M., Rawlison, J.A., and Munro,P. (1984). Dose errors due to charge storage in electron irradiated plastic phantoms. Med. Physics., 21, 1605-9

[2]. International Atomic Energy Agency. Radiation protection and safety of radiation sources: international basic safety standards. International Atomic Energy Agency, Vienna, 2014. Pp. 16- 27.

[3]. Jamema SV, Mahantshetty U, Tanderup K, Malvankar D, Sharma S, Engineer R, et al. Inter-application variation of dose and spatial location of D(2cm(3)) volumes of OARs during MR image based cervix brachytherapy. Radiother. Oncol 2013; 107: 58-62. doi: 10.1016/j.radonc.2013.01.011

[4]. Jones AK, Hintenlang DE, Bolch WE. Tissue-equivalent materials for construction of tomographic dosimetry phantoms in pediatric radiology. Med Phys. 2003;30(8):2072-81.

[5]. A. Kapulsky, E. Mullokandov, and G. Gejerman, "An automated phantom-film QA procedure for intensity-modulated radiation therapy," Med Dosi 27 (3), 201207 (2002).

[6]. Mitchell H.H., Hamilton T.S Ii'. Steggerda R., And Bean H.W. (1945) “The Chemical Composition Of The Adult Human Body And Its Bearing On The Biochemistry Of Growth” Journal of Biological Chemistry, P158.

[7]. DeWerd, L.A. and Kissick, M. (2014) “The Phantoms of Medical and Health Physics: Devices for Research and Development”. Springer, Heidelberg NY, (1), 1-14.

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Wildlife Conservation Strategies and Management in India : An Overview

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ABSTRACT

This audit features the significant issues about untamed life annihilation, peril and protection. It is important to know Current situation about untamed life insurance and preservation at national and global level. Living space protection is the key answer for preserve biodiversity. Parcel of endeavors has been done to support forestation and reduction deforestation and practices has been done in numerous territories. Also by disheartening the pet exchanges, over shooting just as chasing by applying various banes, marine contamination by various laws and guidelines, and open mindfulness are the primary concerns.

Keywords : Wildlife management, wildlife conservation, species recovery, blackbuck, Indian antelope, Antilope cervicapra, royal Bengal tiger, Panthera tigris tigris, gangetic gharial, Gavialis gangeticus, great Indian bustard, Ardeotis nigriceps, India.

I. INTRODUCTION

Untamed life assets comprise an imperative connection in the endurance of the human species and have been a subject of a lot of interest, intrigue, and research everywhere throughout the world. Today, when untamed life natural surroundings are under serious weight and an enormous number of types of wild fauna have turned out to be imperiled, the viable preservation of wild creatures is of incredible centrality. Since all of us relies upon plants and creatures for every single crucial part of our welfare, it is in excess of a matter of accommodation that they keep on existing; it involves life and demise. Being living units of the environment, plants and creatures add to human welfare by giving

- Material benefit to human life;
- Knowledge about genetic resources and their preservation; and
- Significant contributions to the enjoyment of life (e.g., recreation).

Human culture relies upon hereditary assets for all intents and purposes the majority of its nourishment; almost 50% of its meds; a lot of its attire; in certain districts, the majority of its fuel and building materials; and part of its psychological and profound welfare.

Considering the manner in which we are running ahead, careless of what heritage we intend to leave for who and what is to come, the future doesn't appear to be excessively brilliant. Analysts have anticipated that by 2020, the human populace will have expanded by the greater part, and the arable rich land and tropical woods will be not exactly 50% of what they are today. Hereditary assets are treated as limitless mineral assets, however we have to think about them. It is here that the idea of the board and

protection of untamed life becomes possibly the most important factor, since anything that isn't human or undomesticated is 'natural life'.

Nearness or nonattendance of a creature or plant in a locale is controlled by biological and recorded components. Creatures and plants are living pointers of the attributes of their condition; their extents mark the spots where ecological conditions are the equivalent or comparative. To decipher the scope of animal groups appropriately, it is important to know, in detail, the conditions required for the species to live and flourish. The study of zoogeography has both natural and authentic perspectives. On this premise, the world can be isolated into six zoogeographical locales:

Nearctic: North America and Greenland
Palaearctic: Eurasia, without India
Ethiopian: Africa, south of the Sahara
Oriental: India and Indochina
Australian: Australia and New Zealand
Neotropical: South and Central America, and the Antilles

II. METHODS AND MATERIAL

Wildlife Conservation in India:

India is the seventh biggest nation on the planet and Asia's second biggest country with a zone of 3,287,263 km2, a national outskirt of 15,200 km, and a coastline of 7516 km. For managerial purposes, India is partitioned into 28 states and association regions and is home to more than 1 billion individuals, which is roughly 16% of the total populace. Biologically, India can be isolated into three primary locales:

- The Himalayan Mountain system;
- The peninsular India sub region (woodlands and desert); and
- The tropical rain forest region.

A great wealth of biological diversity exists in these regions and in India's wetlands and marine areas. This richness is shown in absolute numbers of species and the proportion of the world's total they represent (Table 1).

Table 1. Number of species in India and the world.

Group	*Number of species in India (SI)*	*Number of species in the world (SW)*	*SI/SW (%)*
Mammals	350	4629	7.6
Birds	1224	9702	12.6
Reptiles	408	6550	6.2
Amphibians	197	4522	4.4
Fishes	2546	21,730	11.7

The individuals of the Indian subcontinent were once honored with the absolute most plentiful normal endowments: verdant woods, water-supplied Himalayan extents, rich waterfront fish assets, beneficial estuaries, lush fields, and abundant waterway frameworks. Copious downpour and rich soils added to this plentitude. Long periods of blunder, be that as it may, have debased our timberlands, injured our coastline, and harmed our springs with destroying results. Today, India contains 172 species (2.9% of the world's all out number) of creatures that are viewed as all inclusive compromised by the IUCN. These incorporate 53 types of warm blooded animals, 69 types of feathered creatures, 23 types of reptiles, and 3 types of creatures of land and water.

Termination is some way or another named 'organic reality' in light of the fact that no species has, up 'til now, existed for in excess of a couple of million years without developing into something other than what's expected or vanishing totally. Elimination is compromising all species, yet more often than not littler creatures, similar to bats and rodents, face this danger more than different creatures. We, nonetheless, will in general spotlight on the appealling lead species, which we like to see and which intrigue us.

Achievement in development is estimated regarding endurance: disappointment, by elimination. Latest terminations can be credited, either straightforwardly or in a roundabout way, to human statistic and innovative development, marketed abuse of species, and human-caused ecological change. These components, thusly, have influenced the regenerative pace of imperiled species and their flexibility to changing natural conditions. Worry for natural life is, truth be told, a worry for ourselves.

In this paper, I might want to address the danger of termination as for four species: the imperial Bengal tiger and blackbuck (well evolved creatures), the incomparable Indian bustard (winged animal), and the gangetic gharial (reptile).

'Project Tiger' and Conservation Practices:

Tigers once possessed a huge zone from Turkey toward the east bank of Russia and China, north to Siberia and south to the Indonesian island of Bali. The illustrious Bengal tiger, Panthera tigris, has consistently been a vital piece of the life and legend of India. Toward the start of the 1900s, the Indian tiger populace was evaluated at 40,000 creatures. The main authority gauge, done in 1972, recorded uniquely around 1800 tigers. This prompted the foundation of a team under the Indian Board of Wildlife, and dependent on their proposals, 'Undertaking Tiger' was propelled on 1 April 1973 with the accompanying destinations:

- To maintain a viable population of tigers in India for scientific, economic, aesthetic, cultural, and ecological values; and
- To preserve, for all times, areas of biological importance as a national heritage for the benefit, education, and enjoyment of the people.

At the beginning of the project, 9 tiger reserves were created. Currently, there are 27 tiger reserves in over 17 states. These reserves cover a total area of 37,761 km2.

Current Status of Royal Bengal Tigers in India:

India has over a large portion of the world's tiger populace. Each two to four years, a far reaching tiger enumeration is led all through India (Table 2). The primary registration was directed in 1972, and 1827 tigers were recorded. Foundation of Project Tiger in 1973 prompted an expansion in the tiger populace; the 1989 statistics recorded 4344 tigers, which prompted self-congrats inside Project Tiger. Be that as it may, the following evaluation in 1993 recorded just 3750 tigers, a decay from four years sooner. Of these tigers, 1266 (36%) were inside the limits of the 19 Project Tiger holds, yet to progressives, this came as a last notice.

Table 2. Population numbers of royal Bengal tigers in India reported by states, 1972–2002.

Serial numbers of enumerated states	*State*	*1972*	*1979*	*1984*	*1989*	*1993*	*1997*	*2001/02*
1	West Bengal	33	65	97	95	97	62	60
2	Karnataka	102	156	202	257	305	350	401
3	Assam	147	300	376	376	325	458	354
4	Uttar Pradesh	262	487	698	735	465	475	284
5	Andhra Pradesh	35	148	164	235	197	171	192
6	Madhya Pradesh	457	529	786	985	912	927	710
	Total	1638	2732	3543	4026	3432	3508	3511

Royal Bengal Tigers and the Sundarbans:

The Sundarbans is a territory of 10,000 km2 of mangrove timberland on the southern edge of the Ganges-Brahmaputra-Meghna Delta in India and Bangladesh. It is viewed as the biggest prograding delta on the planet, and is an open, dynamic, heterogeneous biological framework that is strong to aggravation from inside the timberland and conduits, however is touchy to unsettling influence all things considered, especially to changes in the progression of freshwater. The Sundarbans is a great natural life preservation region of local and worldwide

significance, however a progression of steady acts intended to bring more nourishment, fiber, and material into creation has harmed the Sundarbans biological system.

The Indian piece of the Sundarbans covers 9630 km2 and has been announced a Biosphere Reserve. Venture Tiger covers 2550 km2 of this region, of which 1692 km2 is the center territory (National Park) and has been announced a World Heritage Site. This interesting mangrove timberland region has the biggest populace of tigers in nature. Improved administration has reestablished a wide assortment of greenery. Around there, natural life the board happened basically by observing the ventures made and assessing its belongings.

The last enumeration in December 2001 recorded 271 tigers in the Sundarbans. The Sundarbans is one single environment, in any case, and tigers don't know political outskirts; thus, there is a requirement for cross-fringe censuses to guarantee increasingly precise appraisals of tiger numbers are acquired. India and Bangladesh proposed leading a joint tiger evaluation in the swampy Sundarbans delta, and on 14 January 2004, the two nations mutually started the world's biggest tiger enumeration. The creation and elements of the tiger populace are very reassuring, and the last registration demonstrated the nearness of around 360 creatures in nature. Sedation and translocation of abnormal tigers has been culminated in the territory of West Bengal where the Sundarbans is found. Stray tigers are caught in trap confines or sedated and discharged over into the wild after veterinary consideration and assessment. This is one way that a variant tiger gets another opportunity at opportunity.

India's Tiger Poaching Crisis:

Assessment of the tiger's preservation status uncovered breaking news in the mid 1990s with the disclosure of huge scale poaching and dealing for the illicit universal exchange tiger parts. The immense interest for tiger bones, bound for use in Oriental conventional prescription outside of India and as a macho enhancement, is an additional risk to India's tiger populace. Basically all aspects of the tiger, from its stubbles to its tail, is utilized in conventional Chinese prescription. As indicated by a gauge by the U.S.- based World Watch Institute, individuals in China and somewhere else in the Far East pay significant expenses for tiger bones and other tiger parts, with a solitary tiger's produce getting up to U.S.$5 million.

Poaching is finished by mafia groups and is a piece of the flourishing exchange, which is thought to finance, all things considered, uprising in north India. In 1993–94, 36 tiger skins and 667 kg (1470 lbs) of tiger bones were seized in north India. Poachers utilize one of three strategies to slaughter wild tigers: poison, steel traps, or guns. The evaluated expense for the poachers for every tiger slaughtered is $1 for harming, $9 for catching, and $15 for shooting, disseminated among four poachers. Whenever charged and demonstrated liable, the greatest discipline is three years in prison or potentially Rs.25,000 (U.S.$600) in fines. There is no base sentence.

The Wildlife Protection Society of India has attempted to assemble exact data and record instances of tiger poaching and unnatural passings of tigers all through India. Government sources express that 596 tigers are known to have been executed from 1994 to 2002; notwithstanding, a nongovernment association puts that number a lot higher (Table 3). Albeit worldwide exchange tiger items has been prohibited

under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), just 8 out of the 14 nations inside the tiger's range follow it.

Table 3. Number of tigers poached in India, 1994–2002.

Year	*No. of tigers poached*
1994	95
1995	121
1996	52
1997	88
1998	44
1999	81
2000	53
2001	72
2002	43
Total	649

Constraints to Tiger Conservation:

New security measures proposed by the Committee for the Prevention of Illegal Trade in Wildlife, 1994, have been arranged yet not actualized, and minimal viable move has been made in the field. 80% of the tiger stores don't have a furnished strike power to fill in as a viable framework for battling poaching. The timberland gatekeepers are frequently out-gunned by poachers. Untamed life wrongdoing is the second greatest illicit occupation on the planet after opiates, and it ought to be perceived in that capacity.

Enormous formative ventures, for example, mining and hydroelectric dams, are likewise negatively affecting the tiger's living space. Natural surroundings misfortune is viewed as the main danger to the eventual fate of wild tigers in India.

The Global Tiger Forum and Achievements of Project Tiger:

The International Conference on Tigers was held at New Delhi in March 1990, and was gone to by nations inside the tiger's range. A lion's share of the member nations joined to build up another association—The Global Tiger Forum. The primary point of the gathering is to shield the tiger from eradication at the worldwide level.

Anyplace that tigers live today is excellent untamed life territory. The achievement of Project Tiger has demonstrated that no species, anyway significant, can be rationed in disconnection. Dynamic association of the neighborhood individuals in the administration of parks has made protection estimates increasingly compelling, and asset sharing guarantees correspondence of duty.

Task Tiger has finished in excess of 30 astounding a very long time as the biggest and best preservation venture of its sort on the planet. The task's accomplishments are as per the following:

- Better management of the reserves has improved the status of flora and fauna, and the endangered species have shown signs of recovery. There has also been an improvement in the carrying capacity of the habitat.
- Biogeographically representative areas of the tiger reserves have shown better signs of ecological security and preservation.
- The project has played a major role in providing education to, and recreation facilities for, the people.
- Enhancement programs include the management of buffer areas and tourism facilities in tiger reserves.

The landscape will continue to change, directly and indirectly, at the hands of humans, and as emphasized earlier, survival of humankind depends on maintaining the ecological balance among the living systems of the earth. New management and research initiatives have started a new era in tiger conservation.

Current Status of the Blackbuck /Indian Antelope:

The blackbuck (Antilope cervicapra), or Indian impala, is selective to the Indian subcontinent and is one of the most exquisite eland species in India. Its striking sandy shading and wonderful spiraled horns make it irrefutably the most awe inspiring example of the gazelles. It is likewise the swiftest long-separation sprinter among creatures; at the smallest trace of peril, it can keep running for around 10 km at 60 km/h. A buck with five does establishes a family. Given assurance, blackbucks breed productively.

The blackbuck was once bottomless, yet steady mistreatment by people has tragically decreased its numbers, and it is currently viewed as a jeopardized species. The blackbuck is never again found in areas where it used to flourish. It was disseminated all through the fields of Punjab, Haryana, Uttar Pradesh, Rajasthan, Orissa, Gujarat, and Tamil Nadu, and was chased by the royal states with the assistance of prepared cheetahs.

The blackbuck is basically a creature of open, level, or somewhat undulating territory, and arrives at its most noteworthy bounty in regions secured with thistle and dry deciduous timberlands. With the decimation of timberlands, be that as it may, the creature has adjusted to badlands and agrarian fields. After the vanishing of the cheetah in the mid 1960s, the blackbuck populace detonated, and the species was found in huge numbers in the focal and southern pieces of Punjab. It started to be marked as a yield plunderer and was chased aimlessly, particularly during the 'develop more nourishment battle'. Its substance was savored by all.

Just about 5% of Punjab's absolute geographic zone is forested, and quite a bit of this happens in little strips along streets, railroad lines, and channels where one can't anticipate that much untamed life should happen. Different types of save backwoods have been built up, however they structure just 2% of the absolute region of the state. Also, just 2% of this space has been left to the numerous types of creatures that happen there.

There are five untamed life asylums in Punjab. On account of the blackbuck, the Abohar Wildlife Sanctuary has been set up under the aegis of the Bishnoi people group of the territory. The Bishnoi are a predominately horticultural Hindu people group which refuses felling of trees just as murdering of every single wild creature, including winged animals. The severe strategy of neighborhood collaboration and nonintervention towards the nearby untamed life has given insurance to peafowl, partridges, rabbits, wilderness felines, nilgai, and other wild creatures. Without a doubt, the assurance stood to blackbucks by the Bishnois is excellent, yet the administration ought to likewise build up an arrangement to spare the species.

Current Status of the Great Indian Bustard:

The incomparable Indian bustard (Ardeotis nigriceps) is an enormous, attractive winged creature of the shortgrass fields of the Indian subcontinent. It imparted its territory to the blackbuck (Antilope cervicapra), chinkara (Gazelle bennetti), nilgai (Boselephus tragocamelus), wolf (Canis lupus), fox (Vulpes bengalensis), jackal (Canis aureus), and wild feline (Felis chaus), yet is currently restricted to a couple of pockets in Rajasthan, Gujarat, Madhya Pradesh, Andhra Pradesh, and Karnataka states in India. The incomparable Indian bustard is an imperiled species with under 1000 enduring people. Amusingly, it is the state winged animal of Rajasthan and a marker of the soundness of the meadow environment of the Indian fields, however it is on the

precarious edge of elimination. The incomparable Indian bustard scavenges, havens, shows, and breeds in the fields, and its nonappearance is the primary admonition signal that meadows are weakening.

Table 4. Present numbers of great Indian bustards in sanctuaries.

Sanctuary	*No. of bustards in 1985*	*No. of bustards in 2001*
Karera Sanctuary, Madhya Pradesh	25–30	Extinct
Ghatigaon Sanctuary, Madhya Pradesh	15–18	2–3
Rannibennur Sanctuary, Karnataka	2–3	
Nannaj, Maharastra	15–24	30–40
Sorsan, Rajasthan	10–15	Extinct?
Sonkhaliya, Rajasthan	80+	30–35
Desert National Park, Rajasthan	200–400	50–100
Rollapadu, Andhra Pradesh	60+	15–20

The major problems that face the survival of the great Indian bustard include

- Habitat destruction and deterioration. Too many domestic animals are causing disturbances during the breeding season, and habitat has been lost due to the conversion of grasslands and wastelands to crop fields;poaching. This is widespread in parts of the Thar Desert in Rajasthan;
- Increased numbers of blackbuck and nilgai. Conservation measures for the great Indian bustard that were adopted by the local people have resulted in crop damage due to increased numbers of blackbuck and nilgai; hence, there is resentment among villagers towards the conservation movement, in general, and the bustard, in particular;
- Corruption and total mismanagement of bustard sanctuaries; and
- Lack of clear cut policy on land use and domestic grazing in India.

III. RESULTS AND DISCUSSION

The Need for 'Project Bustard':

Conservation measures in India have shown that by identifying an indicator species and focusing attention on it and its habitat, a substantial part of the natural ecosystem can be protected, which benefits an array of threatened species. The following is a proposed list of objectives for initiating 'Project Bustard':

1. Conserve the habitat types of the great Indian bustard and its associated species;
2. Establish, with the cooperation of the state government and local people, more bustard conservation areas;
3. Supervise and coordinate management of bustard conservation areas;
4. Coordinate long-term studies on bustards and their habitats in different states;
5. Produce educational material for publicity, and for decision makers, stakeholders, students, and others; and
6. Integrate bustard habitat conservation with national grazing policy and overall land use patterns.

The Bombay Natural History Society is a pioneer in promoting the conservation of the great Indian bustard, and undertakes intensive campaigns to educate and encourage the Government of India to take appropriate measures to reverse the declining trend of the species.

IV. CONCLUSION

Natural life territory and species around the globe are confronting an emergency. It is assessed that an unnatural weather change may cause the annihilation of 15–37% of species by 2050. This is another viewpoint which needs consideration since we could lose about 1.25 million species. In contrast to other ecological misfortunes, this one can't be turned around in light of the fact that nature doesn't give fresh opportunities to biodiversity.

On the off chance that we mull over the ordinary reasons why natural life is vanishing in Asia, India is showing improvement over different nations. India has propelled a broad ensured zone system of research establishments in which enactment, financial variables, and natural life research are assuming an incredible job. The Central Zoo Authority assumes a key job with zoos in programming research exercises identified with the protection and proliferation of wild creatures. Arranged research exercises incorporate investigations on natural life science, hereditary inconstancy, species-explicit wholesome necessities, creature conduct, epidemiological reviews, and ailment finding through posthumous assessment. The future relies upon cooperation among hostage and wild creatures, safeguarding of biodiversity, and hereditary and statistic varieties of species. India still has 65% of Asia's tiger populace, 85% of the Asian rhino populace, 80% of the Asian elephant populace, and 100% of the Asiatic lion populace. These are for the most part exceptionally imperiled and poached creatures.

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VI. REFERENCES

[1]. Bishnoi, S.K. 1988. The Bishnoi movement for saving the blackbuck in Abohar area. Pages 40–43 in A.S. Atwal, S.S. Bains, and M.S. Dhindsa, editors. Wildlife of Punjab. Indian Ecological Society, Ludhiana, India.

[2]. Hosette, B.B., and M. Venkateshwarlu. 2001. Trends in wildlife biology conservation and management. Vols. 1 and 2. Daya Publishing House, New Delhi, India.

[3]. Lamba, B.S. 1988. Status of wildlife in Punjab. Pages 20–24 in A.S. Atwal, S.S. Bains, and M.S.Dhindsa, editors. Wildlife of Punjab. Indian Ecological Society, Ludhiana, India.

[4]. Parshad, V.R. 1988. Mammalian fauna of Punjab. Pages 25–38 in A.S. Atwal, S.S. Bains, and M.S. Dhindsa, editors. Wildlife of Punjab. Indian Ecological Society, Ludhiana, India.

[5]. Rahmani, A.R. 2002. The deteriorating status of the Indian bustard. Oriental Bird Club Bulletin 35:45.

[6]. Rahmani, A.R. 2003. Great Indian bustard—on the decline, or on the rise? Birdlife International, 23 August 2003. Available from http://www.birdlife.net/news/search.html.

[7]. Seidensticker, J. 1991. The Bangladesh Sundarbans as wildlife habitat: a look ahead. Proceedings of a workshop on Sundarbans. Part IV: Living off the forest—wildlife management and businesses. November 20–21, 1987. Sustainable Development International Corporation, International Center, Smithsonian Institute, Washington, D.C.

[8]. Stracey, P.D. Wildlife in India, its conservation and control. (These data were taken from various web sites on wildlife in India).

[9]. Assal TJ, Anderson PJ, Sibold J. Spatial and temporal trends of drought effects in a heterogeneous semi-arid forest ecosystem. Forest Ecology and Management. 2016; 365:137-151.

[10]. Atuo FA, Timothy JO, Peter UA. An assessment of socio-economic drivers of avian body parts trade in West African rainforests. Biological Conservation. 2015; 191:614-622.

[11]. Bayne K, Morris TH. Chapter 2 – Laws, Regulations and Policies Relating to the Care and Use of Nonhuman Primates in Biomedical Research. Nonhuman Primate in Biomedical Research. 2012; (2nd ediation):35-56.
[12]. Butler JRA, Young JC, McMyn IAG, Leyshon B, Graham IM, Walker I et al. Evaluating adaptive co- management as conservation conflict resolution: Learning from seals and salmon. Journal of environmental management. 2015; 160:212-225.
[13]. Challender DW, Harrop SR, MacMillan DC. Towards informed and multi-faceted wildlife trade interventions. Global Ecology and Conservation. 2015; 3:129-148.
[14]. Daut EF, Brightsmith DJ, Peterson MJ. Role of non- governmental organizations in combating illegal wildlife–pet trade in Peru. Journal for Nature Conservation. 2015; 24:72-82.
[15]. Dimobe K, Ouédraogo A, Soma S, Goetze D, Porembski S, Thiombiano A. Identification of driving factors of land degradation and deforestation in the Wildlife Reserve of Bontioli (Burkina Faso, West Africa). Global Ecology and Conservation. 2015; 4:559-571.

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Air Quality Analyses for Photochemical Smog Associated with Atmospheric Aerosol Particles and Ozone Precursors Using CMAQ and CAMx Modeling Systems

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ABSTRACT

Pollution due to air quality deterioration is directly or indirectly connected to the phenomenon of biogeochemistry (i.e the scientific discipline that involves the study of the chemical, physical, geological, and biological processes and reactions that influence the composition of the natural environment) which in turn links to the human health. Human health and well-being, along with the well-being of animals, plants, and agricultural products, are solely dependent upon the quality of air we inhale. In response to the emission control threshold levels, prediction of how changes in emission levels could affect ambient air quality has been documented. The use of photochemical air quality models is becoming widely acceptable by various global regulatory agencies for the purpose of regulatory analyses and for the attainment exhibition by evaluating and assessing the effectiveness of control strategies. This review work tries to figure out the two most important and uncommon models namely; Comprehensive Air Quality Model with Extensions (CAMx) and Community Multiscale Air Quality (CMAQ) Modeling System. These modeling systems are used to predict, characterize, determine and simulate the photochemical air quality conditions. This paper gives a substantial detailed information of findings from related multidimensional studies carried out long ago and recently on photochemical smog analyses. Photochemical smog; causes and impacts on both the environment and living-being health were succinctly spelt out. Ozone formation and its different precursors; atmospheric aerosols; emission of biogenics as well as Ozone modeling phases were also discussed. The researcher still talks about the model formulations such as Zhang Model formulation; application and history of CMAQ and CAMx models respectively.

Keywords: Photochemical Smog, Atmospheric Aerosol Particles, Ozone Precursors, CMAQ and CAMx

I. INTRODUCTION

Pollution due to air quality deterioration is directly or indirectly connected to the phenomenon of biogeochemistry (i.e the scientific discipline that involves the study of the chemical, physical, geological, and biological processes and reactions that influence the composition of the natural environment) which in turn links to the human health. Human health and well-being, along with the well-being of animals, plants, and agricultural products, is solely dependent upon the quality of air we inhale (Sillman and Arbor, 2014). In response to the emission control threshold levels, prediction of how changes in emission levels could affect ambient air quality has been introduced (Leone and Seinfeld, 1984). Nowadays, the differences amongst various mechanisms would not be of any concern in as much as each of the mechanisms gives similar predictions over a range of atmospheric conditions. Conversely, much number of recent investigations have established that different mechanisms predict

substantially different degrees of emission controls to achieve the same desired air quality under identical conditions (Jeffries et al., 1981; Whitten, 1981; Carter et al., 1982a; Dunker et al., 1984). The use of photochemical air quality models is becoming widely acceptable by various global regulatory agencies for the purpose of regulatory analysis and for the attainment exhibition by evaluating and assessing the effectiveness of control strategies.

This work tries to figure out the two most important and uncommon models used to predict, characterize, determine and simulate the photochemical air quality conditions. These photochemical models are large-scale air quality models that simulate the changes of pollutant concentrations in the atmosphere using a set of mathematical equations characterizing the physical and chemical processes in the atmosphere. Dry deposition is having a big deal of interest from today's researchers due to its effects on the environment; consequently, there have been significant efforts to measure or estimate dry deposition using a variety of techniques (Mohan, 2016). Photochemical grid models are intended to accurately depict the ways in which air pollution forms, accumulates, and dissipates by simulating the processes that are most essential in generating ozone pollution. These models have emission data from industrial sources, and many other mobile sources that emit chemicals which lead to the formation of ozone and simulate the atmospheric reactions that result in ozone formation. It is documented that photodissociation of many trace gaseous elements has been found to be the precursor for the initiation of most of the atmospheric chemical reactions (Shawn, Jonathan and Kenneth, 1997). The models are driven by meteorological models that are similar to those relied upon by weather forecasters because they can analyze the winds that carry pollutants to other areas around where the source is.

II. PHOTOCHEMICAL SMOG

Photochemical smog is described as a composition of primary and secondary pollutants. Primary pollutants, which include volatile organic compounds (VOCs), and Nitrogen oxides (NOx) are introduced into the atmosphere through vehicular emissions and industrial processes. Whereas secondary pollutants, like ozone (O_3), result from the reaction of primary pollutants with ultraviolet light. Photochemical smog is most common in those cities characterized with sunny and dry seasons and it has a variety of negative health impacts.

2.1 Causes of Photochemical Smog

This type of air pollution is formed through the reaction of solar radiation with airborne pollutants like Volatile Organic Compounds (VOCs), and Nitrogen oxides (NOx). These compounds, which are called primary pollutants, are often introduced into the atmosphere through automobile emissions and industrial processes as earlier said. Ultraviolet light can split nitrogen dioxide into nitric oxide and monatomic oxygen; this monatomic oxygen can then react with oxygen gas to form ozone. Products like ozone, aldehydes, and peroxyacetyl nitrates are called secondary pollutants. The mixture of these primary and secondary pollutants forms what is termed as photochemical smog.

2.2 Ozone

Ozone occurs naturally in the troposphere, predominantly as a result of downward mixing from the stratosphere. This downward mixing includes both direct transport of ozone and transport of NOx, which leads to photochemical formation of ozone in the troposphere. Ozone mixing ratios in the stratosphere (from approximately 20 - 60 km above ground level) are as high as 15 000 parts per billion (ppb). This is higher than ozone concentrations at ground level, even in the most polluted regions, by a factor of 100. Approximately 95% of the Earth's

ozone is located in the stratosphere. Ozone in the troposphere is much lower and generally decreases from the top of the troposphere to ground level. The ozone that is transported downward from the stratosphere is removed through photochemical processes in the troposphere (which include both production and removal of ozone, but with removal rates exceeding production rates). Ozone is also removed through dry deposition at the Earth's surface. Removal of ozone in the troposphere happens on a timescale of approximately three months. In the absence of human activities, ozone concentrations would vary from 200 ppb in the upper troposphere to 10 - 20 ppb at ground level.

2.3 Ozone Precursors (NOx, CO, and Volatile Organics)

Ozone in urban areas is produced from two major classes of precursors: NOx, consisting of NO and NO_2, and VOC. The ozone formation process is also closely associated with the hydroxyl radical (OH). The process of ozone formation is initiated by the reaction of organics (usually primary hydrocarbons) with OH. The subsequent reaction sequence involves NOx and results simultaneously in the production of ozone, oxidation of organics to CO_2, and oxidation of NOx to nitric acid (HNO_3). In urban areas, the ozone formation process is also accompanied by the conversion of NOx to organic nitrates such as peroxyacetyl nitrate ($CH_3CO_3NO_2$, often abbreviated as PAN), which has the effect of transporting NOx to the remote troposphere. In addition to their impact on ozone, NOx and VOC are associated with various other pollutants which impact human health and activities.

However, the effect of CH_4 in particular has been identified as a major influence on ambient ozone because increases in CH_4 lead to increases in ozone worldwide and thus contribute indirectly to urban and regional pollution events (Fiore et al., 2002a; West et al., 2006). Shorter lived volatile organics (with lifetimes ranging from 1hour to 3 days) are more important in terms of urban photochemistry because they undergo reactions rapidly enough to contribute to ozone formation during local air pollution events. Alkenes, aromatics, and oxygenated organic species such as formaldehyde (HCHO) are especially important in terms of urban photochemistry because they initiate reaction sequences that generate additional OH radicals (which catalyze further ozone production) in addition to producing ozone directly.

2.4 Atmospheric Aerosol Particles Atmospheric

Aerosol particles are microscopic solid or liquid matter suspended in the atmosphere of Earth.

The term aerosol commonly refers to the particulate/air mixture, as opposed to the particulate matter alone (Seinfeld and Pandis, 1998). Sources of particulate matter can be natural or anthropogenic (Plainiotis et al., 2010). Particulates, or aerosols, have wide-ranging impacts on both human health and environmental quality, in addition to direct inhalation. These effects account for much of the uncertainty in current predictions for future climate (Forster et al., 2007).

III. EMISSION OF BIOGENICS

In addition to anthropogenic sources, there are significant biogenic sources of organics. Isoprene (C_5H_8) is emitted by a variety of deciduous trees (especially oaks), and these emissions have a significant impact on ozone formation. Terpenes (e.g., a-pinene and $C_{10}H_{10}$) are emitted primarily by conifers and are precursors of particulates. Emission of biogenic VOC often equals or exceeds the rate of emission of anthropogenic VOC at the regional scale, and even within urban areas, biogenic VOC can account for a significant percentage of total VOC reactivity. Biogenic VOC are specifically important due to their relatively short lifetime (1hour or less)

and consequently contribute to local ozone formation during pollution events.

The major significance of biogenic VOC with regard to ozone lies in their implications for the effectiveness of control strategies and their impact on ozone - Nox - VOC chemistry. The presence of biogenic VOC in polluted regions effectively increases the ratio of VOC to NOx, especially when ratios are weighted by the rate of reactivity. Consequently, regions with biogenic VOC are more likely to have ozone formation that is sensitive to NOx rather than VOC (Chameides et al., 1988; Pierce et al., 1998; Simpson, 1995). Biogenic sources of NOx are generally too small to contribute significantly to pollution events. Biogenic NOx emissions can be important in intensively farmed regions, where soil emission of NOx is enhanced by heavy use of fertilizer.

IV. ENVIRONMENTAL AND HEALTH IMPACTS

The consequence of ozone, acid aerosols, and other related pollutants on environment and human health has been the subject of concerns (Dockery et al., 1993; Hoening, 2000; Holgate et al., 1999; Lippman, 2000; Lippman and Schlesinger, 2000; Wilson and Spengler, 1996). It is proved that present ambient levels of both ozone and acid aerosols have pronounced health impacts.

In addition, some studies have discussed that ozone is being linked with both degradation to agricultural crops (Mauzerall and Wang, 2001) and forests (US Congress, 1989). Particulates are responsible for most of the visibility problems associated with air pollution (Seinfeld and Pandis, 1998). The most direct and striking evidence for health effects from air pollution is found in particulates. In United States, a series of studies have shown that mortality rates correlate with exposure to particulates (Dockery et al., 1993; Lippman and Schlesinger, 2000).

Both the primary and secondary pollutants in photochemical smog are highly reactive. These oxidizing compounds have been linked to a variety of negative health outcomes; ozone, for example, is known to irritate the lungs. Smog is a particular health danger in some of the world's sunniest and most populated cities, such as Shanghai in china; the city is typically sunny, and the sun reacts with the chemicals produced by cars and other industrial processes. Hence, most major cities around the globe have problems with smog and air pollution (Lumen, 2019).

V. OVERVIEW OF OZONE MODELING PHASES

Ozone modeling involves two (2) major phases, the ***base case*** and the ***future case*** (with sub steps in each phase). The base case evaluates procedures and ensures that the model is performing correctly. The future case evaluates the effectiveness of controls and demonstrates attainment based on how much ozone will be created in the future. A photochemical grid model simulates the atmosphere above a city by dividing it into thousands of boxes, essentially splitting it into individual grid cells that are typically a few kilometers wide. The thickness of the cells varies as the grid cells that are higher in the atmosphere tend to be thicker than the grid cells closer to the ground. The photochemical model calculates concentrations of pollutants, such as ozone, in each cell by simulating the following four (4) parameters:

i. The movement of air into and out of the grid cells,
ii. The mixture of pollutants vertically among the layers,
iii. The injection of new emissions from sources such as point, area, mobile, biogenic into each grid cell, and

iv. The chemical reactions based on chemical equations, pollution precursors, and incoming solar radiation in each grid cell.

VI. PHOTOCHEMICAL MODELS

The two (2) most popular photochemical models mostly used by the air quality modeling community are the ***Comprehensive Air Quality Model with Extensions (CAMx)*** and the ***Community Multiscale Air Quality (CMAQ)*** Modeling System. These models might experience a rise in popularity in the coming years if the proposal to reduce the ozone primary and secondary standards is finalized as they are multi-scale photochemical modeling system for gas and particulate air pollution.

6.1 The Comprehensive Air quality Model with extensions (CAMx)

The Comprehensive Air quality Model with extensions (CAMx) is a state-of-the-science photochemical grid model that comprises a "one-atmosphere" treatment of tropospheric air pollution (ozone, particulates, air toxics) over spatial scales ranging from neighborhoods to continents. It is an open-source system that is computationally efficient, flexible, and available at zero cost. Meteorological inputs are supplied to CAMx from separate weather prediction models (specifically WRF, MM5 and RAMS are supported). Emission inputs are supplied from external pre-processing systems (e.g., SMOKE and EPS3).

6.1.1 Features of CAMx

In addition to the features this model shares with other photochemical grid models, the most notable features of CAMx are:

6.1.1.1 Two-Way Nested Grid Structure: This can be simply referred to as flexible two-way grid nesting on many map projections. In this case, CAMx can be run with variable grid spacing. Use a coarse grid for regional domains where high spatial resolution is not particularly needed, while in the same run, nest finer grids in specific areas of interest. Two-way nesting propagates information both up and down-scale across all grids. Nests may possess different meshing factors from their parent grids, as long as they are common denominators of parent resolution. A "Flexi-Nesting" feature allows you to introduce and/or remove nested grids at any point during a simulation. You can supply complete information for nested grids (emissions, meteorology, and surface characteristics) or allow CAMx to interpolate any or all of these inputs from parent grids.

6.1.1.2 Parallel Processing: CAMx supports two types of parallelization:

1) Open MP (OMP), which allows parallel processing on shared-memory (e.g., multi-core) computers; and
2) Message Passing Interface (MPI), which allows parallel processing across shared and distributed memory (networked) computer cluster environments.

In order to maximize speed performance, both OMP and MPI can be used in combination. FORTRAN compilers recognize in-code OMP directives. To use MPI, the model must be able to access external MPI libraries installed on the working system.

6.1.1.3 Multiple Photochemical Gas Phase Chemistry Mechanisms: CAMx offers several versions of Carbon Bond chemistry (CB05 and CB6 variants) and the 2007 version of Statewide Air Pollution Research Center chemistry (SAPRC07TC). These mechanisms are solved using the Euler Backward Iterative (EBI) method, which is fast and accurate. CAMx also includes the fully explicit Gear-type Livermore Solver for Ordinary Differential Equations (LSODE), which we use to "benchmark"

new mechanisms and evaluate the performance of EBI. We do not recommend LSODE for typical applications as the model will run much more slowly.

6.1.1.4 Advanced Photolysis Model: This is the **Advanced External Photolysis Model (TUV) with in-line cloud and Aerosol Adjustments.** The TUV radiative transfer and photolysis model (developed and distributed by the National Center of Atmospheric Research), is used as a CAMx pre-processor to provide the air quality model with a multi-dimensional lookup table of clear-sky photolysis rates. CAMx internally adjusts clear-sky rates for the presence of clouds and aerosols using a fast in-line version of TUV.

6.1.1.5 Plume-in-Grid (PiG) Module: PiG treats the chemistry and dispersion of point source emission plumes at sub-grid scales using a Lagrangian puff model, until such time as plume concentrations can be adequately represented on the model grid. Both gas-phase and PM chemistry can be treated. PiG includes a "sampling grid" capability to passively sample plume concentrations at any resolution, which allows visualization of near-source sub-grid scale impacts.

6.1.1.6 Vertical Diffusion (Mixing) Options: CAMx offers a standard "K-theory" approach for vertical diffusion or alternatively version 2 of the Asymmetric Convective Model (ACM2; Pleim, 2007). ACM2 is a hybrid of local K-theory diffusion and non-local convective transport between the surface and layers aloft. ACM2 does not work with the Integrated Process Rate (IPR) component of the Process Analysis (PA) tool.

6.1.1.7 Dry Deposition Options: CAMx offers two dry deposition options: an older approach based on the models of Wesely (1989) and an updated approach based on the algorithms of Zhang et al. (2001; 2003). The Wesely model is formulated for 11 landuse categories, while the Zhang model uses 26 landuse categories. Dry deposition, by which substances are ultimately removed from the atmosphere in the absence of precipitations, can be quantitatively important and its parameterisation, both spatially and temporally, appears essential. The "big-leaf model" formulation was used by Michou et al., 2002 which assures that the concentration of a trace gas at the surface is zero, and that the turbulent transport near and into the surface can be accounted for by three in-series resistances, the aerodynamic, quasi-laminar and surface resistances.

6.1.1.8 Horizontal Advection Solver Options: CAMx uses the Piecewise Parabolic Method (PPM) of Colella and Woodward (1984), and the area-preserving advection solver. Both possess high-order accuracy, little numerical diffusion, and are sufficiently quick for applications on very large grids.

6.1.1.9 Surface Chemistry/Re-emission Model: CAMx includes a simple surface sub-model that treats sorption and penetration of deposited pollutant mass into soil, snow and vegetation, chemical degradation and transformation, and volatilization back into the air (re-emission). The surface model treats any subset of species listed in the core model's chemical mechanism, while all chemical rates, sorption and penetration coefficients are user-defined. The surface model cannot be used with the Plume-in-Grid treatment.

6.1.2 Worldwide Applications of CAMx

CAMx could be employed in a large scale by local, state, regional, and federal government agencies, academic and research institutions, and private consultants for regulatory assessments and general research throughout the world (Ramboll Environ, 2016). CAMx has been notably found to be

effectively used in more than 20 countries on nearly every continent as shown in the map below.

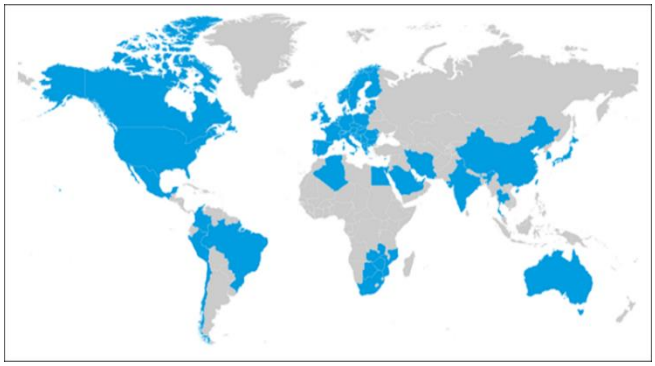


Figure 1: Ramboll Environ, 2016

6.1.3 Model Formulation

6.1.3.1 Core Model Formulation

CAMx simulates the emission, dispersion, chemical reaction, and removal of pollutants by marching the Eulerian continuity equation forward in time (t) for each chemical species (l) on a system of nested three-dimensional grids. The continuity equation specifically describes the time dependency of volume-average species concentration within each grid cell as a sum of all physical and chemical processes operating on that volume. This equation is expressed mathematically in terrain-following height (z) coordinates as follows:

$$\frac{\partial c_l}{\partial t} = -\nabla_H \cdot V_H c_l + \left[\frac{\partial (c_l \eta)}{\partial z} - c_l \frac{\partial^2 h}{\partial z \partial t}\right] + \nabla \cdot \rho K \nabla (c_l / \rho) + \left.\frac{\partial c_l}{\partial t}\right|_{Emission} + \left.\frac{\partial c_l}{\partial t}\right|_{Chemistry} + \left.\frac{\partial c_l}{\partial t}\right|_{Removal}$$

6.1.3.2 The Zhang Model formulation

Environment Canada's AURAMS air quality model uses a state-of-the-science deposition scheme that possesses an updated representation of non-stomatal deposition pathways (Zhang et al. 2003). The approach incorporates the "leaf area index" (LAI), which is an important aspect of newer dry deposition schemes that allows for scaling of pollutant uptake into biota of varying densities. LAI is defined as the ratio of the one-sided green leaf area to a unit area of the ground. It is measured by satellite instruments at fairly high spatial resolution. The Zhang model has been tested extensively through its use in daily air quality forecasting in Canada, and has been shown to reproduce observed fluxes of ozone and SO2 with reasonable accuracy. In CAMx, the Zhang model has tended to generate lower ozone deposition rates relative to the Wesely model, which leads to higher ozone predictions overall. This effect is seasonally dependent and will vary with the definition of LAI. Ozone is less sensitive to the source of LAI (whether Zhang defaults or satellite-enhanced) than to the choice of deposition model.

6.1.3.2.1 Dry Deposition of Gases

The gas resistance model of Zhang et al. (2003) invokes the same 3-resistance equation for deposition velocity as the Wesely (1989) model. The equations for aerodynamic resistance *(r_a)* and boundary resistance *(r_b)* are very similar to the Wesely (1989) formulations. However, Zhang et al. (2003) replace the surface resistance *(r_s)* equation with a new relationship for the overall canopy resistance:

$$r_c = \frac{1}{\frac{1-W_{st}}{r_{st}+r_m} + \frac{1}{r_{cut}} + \frac{1}{r_{ac}+r_{gs}}}$$

Where W_{st} is the fraction of stomatal blocking under wet conditions, r_{cut} is the cuticle resistance, and all other resistances have similar meaning to the Wesely model. Stomatal resistance *(r_{st})* is calculated using a sunlit/shade (so-called "two-big-leaf") stomatal resistance sub-model.

Following Wesely (1989), values for r_g and r_{cut} are calculated for SO_2 and O_3 and then scaled for other gaseous species. Cuticle resistance is slightly different from that defined in traditional big-leaf models in that it also considers the aerodynamic and quasi-laminar resistances of individual leaves. This is done by parameterizing r_{cut} as a function of friction velocity, similar to the concept of overall cuticle uptake considered in a multi-layer model framework.

LAI is used in functions for r_{ac}, and r_{cut}, where the LAI for any given day is linearly interpolated from monthly default LAI as a function of landuse type. To account for LAI effects on surface roughness (z0), a similar daily LAI interpolation is applied to that parameter. Hence, the Zhang model does not require the specification of season, as all resistance equations are continuous over each month (note that CAMx automatically applies the 6-month offset for applications in the southern hemisphere).

For snow on the ground and leaves, both r_{gs} and r_{cut} are adjusted by a snow cover fraction, which is calculated from snow depth, snow age, and landuse type. Snow cover is defined through the input 2D surface file. For surfaces without canopies, r_{gs} is defined as the resistance to any surface (e.g. soil, ice, snow and water), r_{ac} is set to zero, and very large values are used for r_{st}, r_m and r_{cut}.

Over water, the updated temperature-dependent ozone surface resistance equation described above for the Wesely scheme is also used for the Zhang scheme.

The Zhang model includes a set of embedded annual surface roughness ranges and monthly LAI specific to each of the 26 landuse categories. The capabilities of the scheme were extended by adding the option to use episode-specific (i.e. satellite-derived) LAI data. Satellite-based LAI data from MODIS2 (MODerate-resolution Imaging Spectroradiometer) can be processed into gridded LAI fields that are passed to CAMx as an optional record in the time-invariant 2D surface input file. The optional gridded LAI fields are used to scale the default landuse-specific LAI values. For each grid cell, a landuse-weighted default LAI is determined according to the landuse fractions present. An LAI scaling factor is then determined as the ratio of the input LAI to the landuse-weighted default LAI. This factor is used to scale the individual default LAI values for each landuse type in the grid cell, subject to the annual maximum to minimum range among the monthly default values. Figure 2 illustrates how the use of satellite LAI data introduces additional episode-specific variation into the LAI field.

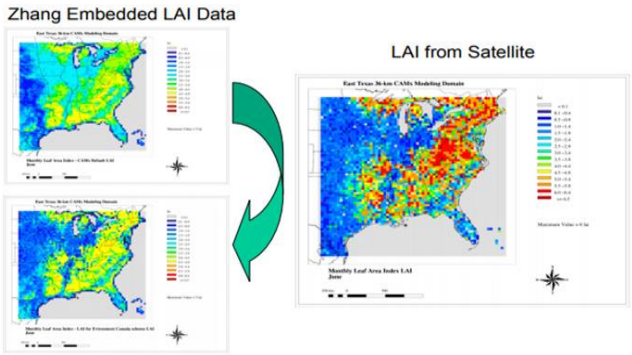
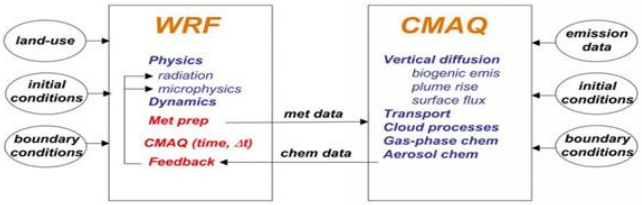


Figure 2: Comparison of monthly LAI data embedded in the Zhang dry deposition scheme against episode-specific LAI for June 2005.

6.2 The Community Multiscale Air Quality (CMAQ) Model

CMAQ is an active open-source development project of the U.S. Environmental Protection Agency (EPA) that consists of a suite of programs for conducting air quality model simulations. CMAQ is supported and distributed by the CMAS Center. The Community Multiscale Air Quality (CMAQ) model is a numerical air quality model that relies on scientific principles to predict the concentration of airborne gases and particles, and the deposition of these pollutants back to Earth's surface. Because it

includes information about the emissions and properties of compounds and classes of compounds, CMAQ can also inform users about the chemical composition of a mixture of pollutants. This is particularly useful when measurements only give insight into aggregate details, like total particulate mass (EPA, 2019).



The purpose of CMAQ is to provide fast, technically sound estimates of ozone, particulates, toxics, and acid deposition. CMAQ is designed to meet the needs of the scientific community and concerned community leaders by combining current knowledge in atmospheric science and air quality modeling, multi-processor computing techniques, and an open-source framework into a single modeling system.

6.2.1 Applications of the CMAQ Model

CMAQ is applied to explore different kinds of air pollution scenarios. For instance, CMAQ is often used to test the impact of future emission regulations. The interaction of meteorology and air quality, e.g. the effects of particles on solar radiation, can be explored with the two-way WRF-CMAQ system, which couples the Weather Research and Forecasting (WRF) meteorological model with the CMAQ air quality model. The Direct-Decoupled Method (DDM) can be used in CMAQ-DDM to quantify the sensitivity of air pollution predictions to model input values like emissions or reaction rates. Often, people want know more about which individual emission source or group of sources are contributing the most to the air pollution at a site. This can be explored using the Integrated Source-Apportionment Method (ISAM) in the CMAQ-ISAM model (EPA, 2019).

6.2.2 CMAQ History

Since 1998, when the first version was released, CMAQ has been used to evaluate potential air quality policy management decisions. The model provides reliable information for decision makers about the estimated impacts of different air quality policies. CMAQ's generalized and flexible formulation has enabled incorporation of alternate process algorithms and numerical solution methods. This has allowed inclusion of new science in the model to address increasingly complex air pollution issues (EPA, 2019).

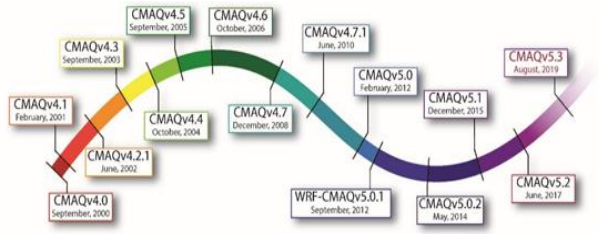


Figure 3: EPA (2019): Community Multiscale Air Quality Modeling System (CMAQ) retrieved on 2/9/2019 available at https://www.epa.gov/cmaq/cmaq-models-0

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VIII. REFERENCES

[1]. Carter, W. P. L., Winer, A. M. and Pitts, J. N., Jr. (1982a); Effect of kinetic mechanisms and hydrocarbon composition on oxidant-precursor relationships predicted by the EKMA isopleth technique. Atmospheric Environment 16, 113-120.

[2]. Carter, W. P. L., Atkinson, R., Winer, A. M., and Pitts, J. N., Jr. (1982b); Experimental investigation of chamber-dependent radical sources. Int. J. Chem. Kinet. 14, 1071-1103.

[3]. Chameides, W. L, Lindsay, R. W, Richardson, J., and Kiang, C. S (1988); The role of biogenic hydrocarbons in urban photochemical smog: Atlanta as a case study. Science 241: 1473-1474.

[4]. Chatfield, R. B, Vastano, J. A, Li, L., Sachse, G. W., and Conners, V. S. (1998); The Great African plume from biomass burning: Generalizations from a three-dimensional study of TRACE A carbon monoxide. Journal of Geophysical Research 103: 28059-28078.

[5]. Colella, P. and Woodward, P. (1984) Journal of Computer and Physics. 54, 174. Mathematic Science Net ADSzb MATH

[6]. Dunker, A. M., Kumar, S. and Berzins, P. H. (1984); A comparison of chemical mechanisms used in atmospheric models. Atmospheric Environment 18, 31 l-321.

[7]. Dockery, D. W, Pope, C. A, Xu, X. et al., (1993); An association between air pollution and mortality in six U.S. cities. New England Journal of Medicine 329: 1753-1759.

[8]. Dodge MC (2000); Chemical oxidant mechanisms for air quality modeling: Critical review. Atmospheric Environment 34: 2103-2130.

[9]. EPA (2019); Community Multiscale Air Quality Modeling System (CMAQ) retrieved on 2/9/2019 available at https://www.epa.gov/cmaq/cmaq-models-0

[10]. Eschenroeder, A. Q. and Martinez, J. R. (1971); concept and applications of photochemical smog models; General Research Corporation, Santa Barbara, California 93105

[11]. Fiore, A. M, Jacob, D. J, Bey, I., et al., (2002a); Background ozone over the United States in summer: Origin, trend, and contribution to pollution episodes. Journal of Geophysical Research 107(D15): 4275.

[12]. Fiore, A. M, Jacob, D. J, Field, B. D, Streets, D. G, Fernandes, S. D, and Jang, C. (2002b); Linking ozone pollution and climate change: The case for controlling methane. Geophysical Research Letters 29(19): 1919.

[13]. Fiore, A. M, Jacob, D. J, Logan, J. A, and Yin, J. H (1998); Long-term trends in ground level ozone over the contiguous United States, 1980-1995. Journal of Geophysical Research 103: 1471-1480.

[14]. Fiore, A. M, Dentener, F. J, Wild, O., et al., (2009); Multi - model estimates of intercontinental source-receptor relationships for ozone pollution. Journal of Geophysical Research 114: D04301.

[15]. Forster, P., Ramaswamy, V., Artaxo, P., et al., (2007); Changes in atmospheric constituents and in radiative forcing. In: Solomon S, Qin D, and Manning M, et al. (eds.) Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change; Cambridge/New York: Cambridge University Press.

[16]. Hoening, J. Q (2000); Health Effects of Ambient Air Pollution: How Safe Is the Air We Breathe? Norwell/Dordrecht: Kluwer Academic Publishers.

[17]. Holgate, S. T, Samet, J. M, Koren, H. S, and Maynard, R. L. (eds.) (1999); Air Pollution and Health. London/San Diego: Academic Press.

[18]. Jeffries, H. E., Sexton, K. G. and Salmi, C. N. (1981); Effects of chemistry and meteorology on ozone control calculations using simple trajectory models and the EKMA procedure. Final Report to the U.S. Environmental Protection Agency under contract No. 68-02-3523, School of Public Health, University of North Carolina, Chapel Hill, North Carolina.

[19]. Leone, J. A. and Seinfeld, J. H. (1984); comparative analysis of chemical Reaction

Mechanisms for phytochemical smog; California institute of technology, Pasadena.

[20]. Lippman, M. (ed.) (2000); Environmental Toxicants: Human Exposures and Their Health Effects. New York: Wiley-Interscience.

[21]. Lippman, M. and Schlesinger, R. B. (2000); Toxicological bases for the setting of health-related air pollution standards. Annual Review of Public Health 21: 309-333.

[22]. Lumen (2019); chemistry and the real world retrieved on 25/08/2019 from https://courses.lumenlearning.com/introchem/chapter/photochemical-smog/

[23]. Mauzerall, D. L., Narita, D., Akimoto, H. et al., (2000); Seasonal characteristics of tropospheric ozone production and mixing ratios over east Asia: A global three dimensional chemical transport model analysis. Journal of Geophysical Research 105: 17895-17910.

[24]. Mauzerall, D. L. and Wang, X. (2001); Protecting agricultural crops from the effects of tropospheric ozone exposure: Reconciling science and standard setting in the United States, Europe, and Asia. Annual Review of Energy and the Environment 2001(26): 237-268

[25]. Michou M., Brocheton F., Dufour A., Peuch VH. (2002) Surface Exchanges in the Multiscale Chemistry and Transport Model MOCAGE. In: Sportisse B. (eds) Air Pollution Modelling and Simulation. Springer, Berlin, Heidelberg

[26]. Mohan, S. Mariraj (2016) An overview of particulate dry deposition: measuring methods, deposition velocity and controlling factors; International Journal of Environmental Scienec Technology. 13:387 - 402, DOI 10.1007/s13762-015-0898-7

[27]. Parrish, D. D, Dunlea, E. J, Atlas, E. L, et al., (2004); Changes in the photochemical environment of the temperate North Pacific troposphere in response to increased Asian emissions. Journal of Geophysical Research 109: D23S18.

[28]. Pierce, T., Geron, C., Bender, L., Dennis, R., Tonnesen, G., and Guenther, A. (1998); Influence of increased isoprene emissions on regional ozone modeling. Journal of Geophysical Research 103: 25611-25630.

[29]. Plainiotis, S.; Pericleous, K.A.; Fisher, B.E.A.; Shier, L. (January 2010). "Application of Lagrangian particle dispersion models to air quality assessment in the Trans-Manche region of Nord-Pas-de-Calais (France) and Kent (Great Britain)". International Journal of Environment and Pollution (IJEM). 40 (1/2/3): 160-174. doi:10.1504/IJEP.2010.030891]

[30]. Pleim JE (2007) A combined local and nonlocal closure model for the atmospheric boundary layer, part I: model description and testing. Journal of Applied Meteorology and Climatology 46:1383 - 1395

[31]. Ramboll Environ (2016); CAMx Applications Worldwide Retrieved on 3/9/2019, available at http://www.camx.com/about/us-camx-applications.aspx

[32]. Seinfeld, J. H. and Pandis, S. (1998). Atmospheric Chemistry and Physics: From Air Pollution to Climate Change (2nd ed.). Hoboken, New Jersey: John Wiley & Sons. p. 97. ISBN 978-0-471-17816-3.

[33]. Shawn J. Rossele, Jonathan E. Pleim, and Kenneth, L. Schere (1997); development and testing of an improved photolysis rate model for regional photochemical modelling; presentation at the air and waste management association's 90th annual meeting and exhibition, Toronto, Ontario, Canada. 97 - RP94B.01

[34]. Sillman, S., Vautard, R., Menut, L., and Kley, D. (2003); O3-NOx-VOC sensitivity and NOx-VOC indicators in Paris: Results from models

and Atmospheric Pollution over the Paris Area ESQUIF measurements; Journal of Geophysical Research.

[35]. Sillman, S. and Arbor, A. (2014); Tropospheric Ozone and Photochemical Smog; university press, university of Michigan.

[36]. Simpson, D. (1995); Biogenic emissions in Europe 2; Implications for ozone control strategies. Journal of Geophysical Research 100: 22891-22906

[37]. US Congress (1989); Catching Our Breath: Next Steps for Reducing Urban Ozone. Office of Technology Assessment OTA-O-412. Washington, DC: US Government Printing Office.

[38]. Wesely (1989) Wesely, M.L., Parameterization of surface resistances to gaseous dry deposition in regional-scale numerical models, Atmospheric Environment, 23, 6, 1293 - 1304, 1989.

[39]. West, J. J, Fiore, A. F, Horowitz, L. W, and Mauzerall, D. L. (2006); Global health benefits of mitigating ozone pollution with methane emission controls. Proceedings of the National Academy of Sciences of the United States of America 103(11): 3988 - 3993.

[40]. Whitten, G. Z. (1981); Comments at U.S. Environmental Protection Agency Workshop on the Empirical Kinetic Modeling Approach, 15-16 December, Research Triangle Park, N.C.

[41]. Wilson, R. and Spengler, J. D. (eds.) (1996) Particles in Our Air: Concentrations and Health Effects. Cambridge, MA: Harvard School of Public Health, Harvard University Press.

[42]. Wilson, W. E. and Suh, H. H. (1997); Fine particles and coarse particles: Concentration relationships relevant to epidemiologic studies. Journal of the Air and Waste Management Association 47: 1238-1249.

[43]. Zhang L, Vet R (2006) A review of current knowledge concerning size-dependent aerosol removal. China Particuol 4(6):272 - 282

[44]. Zhang L, Gong S, Padro J, Barrie L (2001) A size-segregated particle dry deposition scheme for an atmospheric aerosol module. Atmospheric Environ 35:549-560

[45]. Zhang L, Fang GC, Liu CK, Huang YL, Huang JH, Huang CS (2012) Dry deposition fluxes and deposition velocities of seven trace metal species at five sites in Central Taiwan - a summary of surrogate surface measurements and a comparison with model estimation. Atmospheric Chemistry Phys 12:3405 - 3417

[46]. Zhang Zhihua & Chibiao Chen & Jian Sun & Kap Luk Chan (2003): "EM algorithms for Gaussian mixtures with split-and-merge operation." Pattern Recognition 36: 1973 - 1983

[47]. Zheng M, Guo Z, Fang M, Rahn KA, Kester DR (2005) Dry and wet deposition of elements in Hong Kong. Mar Chemical 97:124 - 139

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A Comprehensive Review on Data Storage

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ABSTRACT

Data storage is the collective methods and technologies that capture and retain digital information on electromagnetic, optical or silicon-based storage media. Storage is a key component of digital devices, as consumers and businesses have come to rely on it to preserve information ranging from personal photos to business-critical information. Modern storage systems require enhanced capabilities to allow enterprises to apply machine learning-enabled artificial intelligence (AI) to capture this data, analyze it and wring maximum value from it. This paper provides an overview of data storage technologies, evaluation of storage heirarchy and importance of data storage.

Keywords : Data Storage, Technologies, Storage Hierarchy

I. INTRODUCTION

The term storage may refer both to a user's data generally and, more specifically, to the integrated hardware and software systems used to capture, manage and prioritize the data. This includes information in applications, databases, data warehouses, archiving, backup appliances and cloud storage. Digital information is written to target storage media using software commands. The smallest unit of measure in a computer memory is a bit, described with a binary value of 0 or 1, according to the level of electrical voltage contained in a single capacitor. Eight bits make up one byte.

Data storage capacity requirements define how much storage is needed to run an application, a set of applications or data sets. Capacity requirements consider the types of data. For instance, simple documents may only require kilobytes of capacity, while graphic-intensive files, such as digital photographs, may take up megabytes, and a video file can require gigabytes of storage. Computer applications commonly list the minimum and recommended capacity requirements needed to run them.

On an electromechanical disk, bytes store blocks of data within sectors. A hard disk is a circular platter coated with a thin layer of magnetic material. The disk is inserted on a spindle and spins at speeds of up to 15,000 revolutions per minute (rpm). A sector on a standard disk is 512 bytes. Recent advances in disk include shingled magnetic recording, in which data writes occur in overlapping fashion to boost the platter's areal density.

On solid-state drives (SSDs), data is written to pooled NAND flash, designed with floating gate transistors that enable the cell to retain an electrical charge. An SSD is not technically a drive, but it exhibits design characteristics similar to an integrated circuit, featuring potentially millions of nano transistors placed on millimeter-sized silicon chips. Backup data copies are written to disk appliances with the aid of a hierarchical storage management system. And although less commonly practiced than in years past, the tactic of some organizations remains to write disk-

based backup data to magnetic tape as a tertiary storage tier. This is a best practice in organizations subject to legal regulations.

A virtual tape library (VTL) uses no tape at all. It is a system in which data is written sequentially to disks but retains the characteristics and properties of tape. The value of a VTL is its quick recovery and scalability.

Larger application scripts and real-time database analytics have contributed to the advent of highly dense and scalable storage systems, including high-performance computing storage, converged infrastructure, composable storage systems, hyper-converged storage infrastructure, scale-out and scale-up network-attached storage (NAS) and object storage platforms.

II. METHODS AND MATERIAL

EVALUATION OF STORAGE HIERARCHY

Organizations increasingly use tiered storage to automate data placement on different storage media, based on an application's capacity, compliance and performance requirements.

Enterprise data storage is often classified as primary and secondary storage, depending on how the data is used and the type of media it requires. Primary storage handles application workloads central to a company's day-to-day production and main lines of business.

Primary storage is occasionally referred to as main storage or primary memory. Data is held in random access memory (RAM) and other built-in devices, such as the processor's L1 cache. Secondary storage encompasses data on flash, hard disk, tape and other devices requiring I/O operations. Secondary storage media is often used in backup and cloud storage.

Primary storage generally provides faster access than secondary storage due to the proximity of storage to the computer processor. On the other hand, secondary storage can hold much more data than primary storage. Secondary storage also replicates inactive data to a backup storage device, yet keeps it highly available in case it is needed again.

Digital transformation of business has prompted more and more companies to deploy multiple hybrid clouds, adding a remote tier to buttress local storage.

TYPES OF DATA STORAGE DEVICES/MEDIUMS

Data storage media have varying levels of capacity and speed. These include cache memory, dynamic RAM (DRAM) or main memory; magnetic tape and magnetic disk; optical disc, such as CDs, DVDs and Blu-ray disks; flash memory and various iterations of in-memory storage; and cache memory.

The main types of storage media in use today include hard disk drives (HDDs), solid-state storage, optical storage and tape. HDDs are widely used storage in personal computers, servers and enterprise storage systems, but SSDs are starting to reach performance and price parity with disk.

Optical data storage is popular in consumer products, such as computer games and movies, and is also used in high-capacity data archiving systems. Intel optane memory is a smart technology that accelerates computer’s responsiveness. It accesses your computer’s frequently used documents, pictures, videos, and applications quickly and remembers them after you power off enabling you to create, game, and produce with less waiting. This increases productivity across the board tailored to an individual’s everyday usage.

IMPORTANCE OF DATA STORAGE

Underscoring the importance of storage is a steady climb in the generation of new data, which is attributable to big data and the profusion of internet of things (IoT) devices. Modern storage systems require enhanced capabilities to allow enterprises to apply machine learning-enabled artificial intelligence (AI) to capture this data, analyze it and wring maximum value from it. Larger application scripts and real-time database analytics have contributed to the advent of highly dense and scalable storage systems, including high-performance computing storage, converged infrastructure, composable storage systems, hyper-converged storage infrastructure, scale-out and scale-up network-attached storage (NAS) and object storage platforms.

In these days the quantity of data created per second is very large. Data stream real time analysis is required to manage this large data. Through proper analysis we can get crucial data, through this we can predict network traffic, intrusion related activity weather log records or click systems in web exploring manufacturing process, call details records, email, blogging, twitter posts and others. Data generated from stream is just snapshot of stream data. Snapshot is based on time interval. The main of algorithms is usage of resources. Resources can be memory or time. In stream database, to perform stream mining we must consider accuracy, amount of space, time required to learn from training examples for getting prediction. Data is large and growing. There are important patterns and trends in the data. We don't fully know where to look or how to find them. Big data analysis is most important because the data is continuously changing based on interval of time to store Big data most of companies are using cloud setup.

Big data storage space is a storage framework that is designed especially to store, take care of as well as retrieve massive quantities of information, or huge data. Big data storage enables the storage space and sorting of huge data as if it can easily be accessed, used as well as refined by applications as well as services dealing with large information. Big Data has actually gotten much focus from the academic community and also the IT market. Huge data has obtained much attention from the academia and also the IT industry. Currently, over 2 billion people globally are connected to the Net and also over 15 billion individuals very own smart phones. By 2020, 50 billion tools are expected to be linked to the internet. At this moment, predicted information manufacturing will be 44 times higher than that in 2015. As info is transferred and shared at light speed on optic fiber as well as wireless networks, the quantity of information and rate of market development boost. Nonetheless, the fast development rate of such big information generates many difficulties such as the quick growth of information, transfer speed, diverse data as well as safety and security.

III. RESULTS AND DISCUSSION

MERITS AND DEMERITS OF ONLINE DATA STORAGE

Merits of Online Data Storage

- **Data storage saving:** By storing your data online you are reducing the burden of your hard disk, which means you are eventually saving disk space.
- **Worldwide accessibility:** This is the main advantage of online data storage. You can access your data anywhere in the world. You don't have to carry your hard disk, pen drive or any other storage device.
- **Data safety:** You cannot trust your HDD and storage device every time because it can crash anytime.

In order to make your data safe from such hazards you can keep it online.

- **Security:** Most of the online storage sites provide better security.
- **Easy sharing:** you can share data faster, easy and secure manner.
- **Data recovery:** online data storage sites provide quick recovery of your files and folders. This makes them more safe and secure.
- **Automatic backup:** you can even schedule automatic backup of your personal computer in order to avoid manual backup of files.

Demerits of Online Data Storage

Online data storage has its negative aspects however if managed well you can definitely prevent them. Several of them are as complies with:

- Inappropriate handing can cause trouble: You have to require your user-id and password safe to safeguard your information as if someone knows or perhaps presume your qualifications, it might lead to loss of information. Use facility passwords and also try to prevent storage them in your personal storage devices such as pen drive and HDD.
- Select trustworthy resource to avoid any type of danger. To access your files almost everywhere the only thing you need is net link. If you do not obtain internet connection someplace after that you will certainly end up with no gain access to of information despite the fact that it is securely stored online.

HIGHLIGHTS OF THE DATA STORAGE TECHNOLOGIES

• **Redundant Array of Independent Disks (RAID):** This technology was developed to address the cost, performance and availability requirements of data. It continues to evolve today, and is used in all storage architectures such as DAS, SAN, etc. (See below for RAID Chart.)

• **Direct-Attached storage (DAS):** This type of storage connects directly to the server (host) or a group of servers in a cluster. Storage can be either internal or external to the server. External DAS alleviated the challenges of limited internal storage capacity.

• **Storage Area Network (SAN):** This is a dedicated, high-performance Fiber Channel (FC) network to facilitate block-level communications between servers and storage. Block storage is just that: evenly sized blocks of data. Database servers can often take advantage of block storage systems. Storage is partitioned and assigned to a server for accessing its data. SAN offers scalability, availability, performance and cost benefits compared to DAS.

• **Network-Attached Storage (NAS):** This is dedicated storage for file servicing applications. Unlike SAN, it connects to an existing communication network (LAN) and provides file access to heterogeneous clients. This is the most familiar kind of storage – it's what we interact with most on a daily basis. Users of file storage have access to files and can read and write to either the whole file or a part of it. File systems are what operating systems provide on all of our personal computers. In a shared environment file storage is often seen as a network drive. Because it's purposely built for providing storage to file server applications, it offers higher scalability, availability, performance and cost benefits compared to the general-purpose file servers.

• **Internet Protocol SAN (IP-SAN):** IP-SAN is a convergence of technologies used in SAN and NAS. IP-SAN provides block-level communication across a local or wide area network (LAN or WAN), resulting in greater consolidation and availability of data.

Object Storage

Object storage is possibly the least familiar sort of storage to the majority of people. Object storage space doesn't give accessibility to raw blocks of data and also does not supply file-based access. Object storage space provides accessibility to whole objects, or balls of data as well as normally does so with an API particular to that system. Unlike documents storage, object storage typically does not permit the ability to write to one part of a file. Objects have to be upgraded all at once system. Three of the most usual business things storage systems are Amazon's S3, Google's Cloud and Microsoft's Azure. Perfect use cases consist of backups, archiving as well as static Web web content like images and also manuscripts. One of the major benefits of object storage space systems is their capacity to dependably store a large amount of data at reasonably inexpensive.

IV. CONCLUSION

Data storage is the recording (storing) of information (data) in a storage medium. DNA and RNA, handwriting, phonograp hic recording, magnetic tape, and optical discs are all examples of storage media. Recording is accomplished by virtually any form of energy. Electronic data storage requires electrical power to store and retrieve data. In this paper, a comprehensive overview is provided on data storage.

V. FUTURE SCOPE

I recommend using online data storage such as Cloud Data Storage which provides all the advantages of Online Data Storage. To get the highest benefit of Online Data Storage take the necessary security measures and precautions. Like Amazon Webservices and Azure who implement Cloud Technology to store data.

VI. REFERENCES

[1]. https://en.wikipedia.org/wiki/Data_storage

[2]. https://searchstorage.techtarget.com/definition/storage

[3]. https://beginnersbook.com/2013/04/advantages-and-disadvantages-of-online-data-storage/

[4]. http://dataarchivecorp.com/evolution-of-data-storage/

[5]. Patterson, David A.; Hennessy, John L. (2005). Computer Organization and Design: The Hardware/Software Interface (3rd ed.). Amsterdam: Morgan Kaufmann Publishers. ISBN 1-55860-604-1. OCLC 56213091.

[6]. Anusha Medavaka, “An Overview of Security Mechanisms Towards Different Types of Attacks” in “International Journal of Scientific Research in Science and Technology”, Vol. 4, Issue No. 10, October-2018ISSN : 2395-602X]

[7]. Storage as defined in Microsoft Computing Dictionary, 4th Ed. (c)1999 or in The Authoritative Dictionary of IEEE Standard Terms, 7th Ed., (c) 2000.

[8]. Anusha Medavaka,“A study on the process of hiding protective information from the big data processing databases” in “International journal of basic and applied research”, Vol. 9, Issue No. 6, June-2019ISSN : 2278-0505]

[9]. "Primary Storage or Storage Hardware" (shows usage of term "primary storage" meaning "hard disk storage") Archived 10 September 2008 at the Wayback Machine. Searchstorage.techtarget.com (2011-06-13). Retrieved on 2011-06-18.

[10]. Anusha Medavaka,“K-Means Clustering Algorithm to Search into the Documents ContainingNatural Language” in “International Journal of Scientific Research in Science and

Technology", Vol. 3, Issue No. 8, Dec-2017ISSN : 2395-602X]

[11]. Anusha Medavaka,Siripuri Kiran, "Implementation of dynamic handover reduce function algorithm towards optimizing the result in reduce function" in "International Journal of Academic Research and Development", Vol. 4, Issue No. 4, July-2019ISSN : 2455-4197]

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